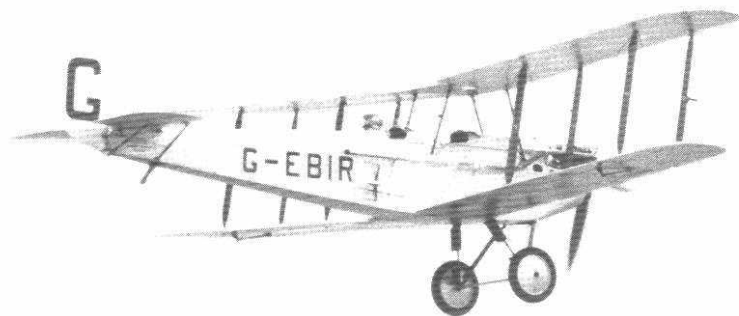


DeHavilland Aircraft

since 1909

A J Jackson





de Havilland D.H.51, *G-EBIR* and D.H.60 Moth *G-EBLV* in formation at the Hawker Siddeley Aviation open day at Hatfield in July 1973. Both were built in 1925 and were thus the oldest airworthy British civil-registered biplanes.

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A J Jackson

Revised and Updated
by
R. T. Jackson

**Naval
Institute
Press**

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deputy manager, Hawker Siddeley Public Relations, who threw open their photo files and granted access to the log books of Sir Geoffrey de Havilland and his sons; W. K. Mackenzie for notes and photographs made in the very early Stag Lane days; John Hopton for gems from the photograph collection of Australian pioneer commercial pilot C. D. Pratt; Brian Reed who dug deep into Qantas historical material; Peter M. Bowers who supplied all the early American photographs; V. W. Clarkson for permitting the use of his researches into the short-lived D.H.92 Dolphin; David Roberts whose meticulous proof reading and indexing have become such an essential part of all this author's work; and L. E. Bradford who has prepared excellent project drawings to supplement his earlier three-views.

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Leigh-on-Sea, Essex, July 1977

A. J. J.

ADDITIONAL FOREWORD

My late father had a special affection for de Havilland aircraft and was particularly fond of flying Tiger Moths, most of all the Tiger Club's veteran *G-ACDC*, which before the war was based at Hatfield with the de Havilland School of Flying. I was therefore particularly pleased to be asked to update this book *de Havilland Aircraft since 1909* so that a third edition could be published.

Thanks are due to all those who supplied information which assisted me in my task, particularly:—M. J. Abbott; Malcolm Fillmore; J. F. Franks; Stuart McKay of the De Havilland Moth Club; C. F. Morris, Chief Engineer of the Shuttleworth Collection; M. C. Russell, of the Rus-savia Collection and J. G. H. Visser.

Leigh-on-Sea, Essex, January 1987

R. T. Jackson



The entrance to the administrative wing of the de Havilland Aircraft Company's Hatfield factory.

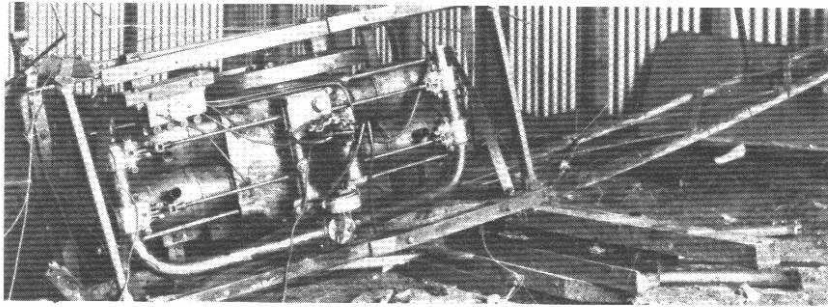
History of the Company

de Havilland Beginnings

Geoffrey de Havilland and his brothers Ivon and Hereward, sons of the Rev. Charles de Havilland of Crux Eaton, near Highclere, Hants., were exceptionally mechanically minded, and Geoffrey, who was educated first in Rugby and then at St. Edward's School, Oxford, spent the years 1900 to 1903 at the Crystal Palace Engineering School. Here he built one of Britain's earliest motor cycles with an engine of his own design on which to commute to and from Crux Eaton. His older brother Ivon, no less gifted, was already chief designer to the Iris Motor Company of Willesden, Middlesex.

In 1906, while living in Walthamstow and designing one of London's first buses for the Motor Omnibus Construction Company, Geoffrey de Havilland met F. T. Hearle, a Cornish marine engineer working as a mechanic for the Vanguard Omnibus Company and destined to be his brother-in-law and life-long business associate. Pioneer free flight attempts had, however, held his attention since boyhood and inevitably, in 1908, with a £500 loan from grandfather, he forsook the motor bus to design a 45 h.p. flat four water-cooled engine to power an aeroplane of his own construction. It had a power/weight ratio only half that of the Wright brothers' engine and was built for £250 by the Iris Motor Company in their works at Scrubbs Lane, Willesden.

He then rented a workshop off Bothwell Street, Fulham, and with the assistance of F. T. Hearle built a wire-braced biplane with front elevator and bicycle wheel undercarriage. Geoffrey's young wife made the cotton covering on a hand sewing machine and the engine, mounted at right angles to the fuselage, drove two aluminium propellers through bevel gearing. In 1909 the finished aircraft was taken to Seven Barrows on the North Hampshire Downs near Crux Eaton and erected in a shed recently vacated by J. T. C. Moore Brabazon but it was December before conditions were suitable for risking flight in such a flimsy structure. When the day came, de Havilland took off downhill and became briefly airborne before the port wings failed and the aircraft was wrecked, fortunately without serious injury to the pilot.



Geoffrey de Havilland's original 45 h.p. Iris-built engine lying on its side in the remains of the fuselage of his first biplane. (By courtesy of Philip Jarrett.)

In his second biplane, inadequate spars of locally purchased whitewood gave way to straight grained spruce and ash, and the engine was mounted normally to drive a single pusher propeller. A successful quarter mile flight, made at Seven Barrows on September 10, 1910, was followed quickly by figure eights, a first passenger flight for Hearle and, in October, for his wife and 8 month old son Geoffrey who, some 30 years later, was to be his Chief Test Pilot.

At the end of 1910 the aircraft was taken by road to Farnborough and following a successful one hour acceptance test, flown by the designer on January 14, 1911, it was purchased by the War Office for £400 and used by de Havilland on February 7 to qualify for Royal Aero Club Certificate No. 53. He and Hearle were taken on by H.M. Balloon Factory (later the Army Aircraft Factory) as designer/pilot and mechanic respectively but the aircraft, now known as the F.E.1, crashed on August 15 while being flown by the Assistant Superintendent, Lt. J. T. Ridge. A redesigned version, the F.E.2, with nacelle and 50 h.p. Gnome rotary, flew for the first time three days later. In this aeroplane, which was not a rebuild of the F.E.1 as has been widely supposed, de Havilland qualified for R.Ae.C. Special Certificate No. 4 for a 100 mile flight to Shrewton, near Larkhill, and back on December 6, 1911.

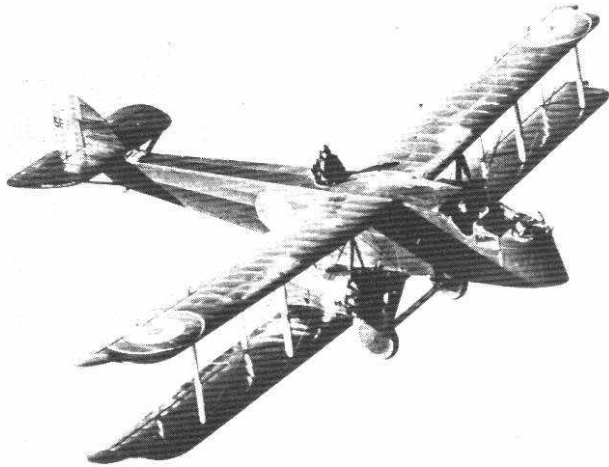
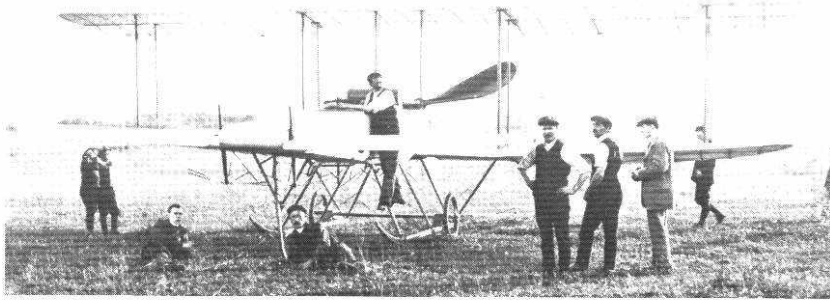
In 1912, when Farnborough was renamed the Royal Aircraft Factory and the Royal Flying Corps had come into being, civilians were offered commissions in its Special Reserve. de Havilland joined as a Second Lieutenant so that he might fly on manoeuvres, but remained in his civilian occupation and became Inspector of Aircraft briefly at the end of 1913.

Assisted by F. M. Green he was responsible for the 1911 S.E.1 canard pusher and, in collaboration with H. P. Folland, the B.E.1 tractor biplane. On August 12, 1912 he set up a British altitude record of 10,560 ft. in the first B.E.2 with Maj. F. H. Sykes, Commandant of the Military Wing, Royal Flying Corps, as passenger and soon afterwards, although ineligible to compete, convincingly demonstrated its superiority over the winning Cody biplane at the Larkhill Military Aeroplane Competitions.

The B.S.1 fast single seater flew early in 1913 but in March de Havilland was injured when it spun off a turn due to inadequate rudder control. It was repaired, fitted with a larger rudder, and redesignated B.S.2 (later S.E.2) but this was his last design before leaving to become Chief Designer to George Holt Thomas's Aircraft Manufacturing Co. Ltd. at The Hyde, Hendon in June 1914. Two months later at the outbreak of war, he was called for service with No. 2 Squadron, Farnborough but after some months, when the War Office had been persuaded that he was more use to his country as a designer, he was promoted Captain and resumed work at Hendon where he was responsible for a series of aircraft which played a significant part in the conduct of the war. These ranged from the 1915 D.H.1 reconnaissance biplane to the D.H.9A day bomber but before December 1918, when the name Airco came into general use, the Company used the name Air-Co on its production name plates. Nevertheless its



Left: Geoffrey de Havilland in the pilot's seat of his second biplane. Right: de Havilland in the Royal Aircraft Factory B.E.3 at Farnborough in 1912. (Crown Copyright Reserved.)



The speed with which de Havilland grasped the principles of aircraft design is well illustrated by comparing his 1911 'stick and string' S.E.1 canard with the D.H.11 bomber built only seven years later. (S.E.1—Imperial War Museum Q.66008.)

products were always known simply as D.H., thus starting a system of nomenclature which remained in use until the days of the great de Havilland Enterprise of a generation later.

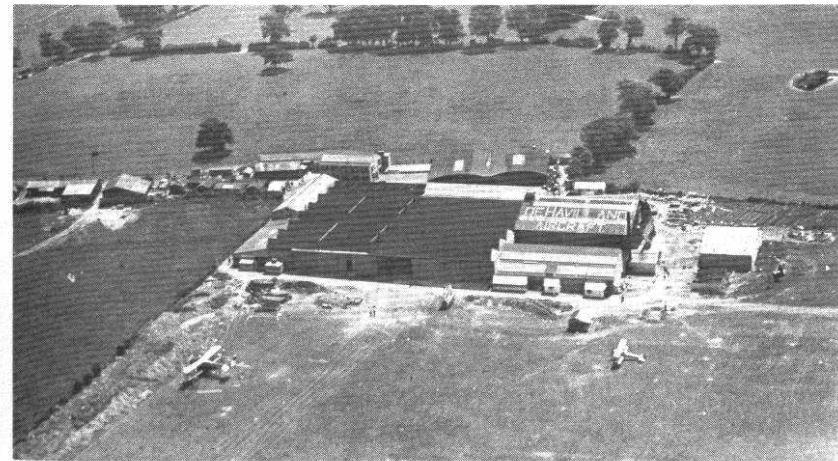
After the war the world's first international scheduled service was flown from Hounslow to Le Bourget by a converted D.H.4 bomber of Aircraft Transport and Travel Ltd. This was an Airco subsidiary which also operated Amsterdam services for K.L.M. in 1920 using a cabin conversion of the wartime D.H.9A known as the D.H.16. In the sporting field a clipped wing D.H.4 won the 1919 Aerial Derby at almost 130 m.p.h. Then, to give Airco a better peacetime footing, Holt Thomas sold out to the Birmingham Small Arms Co. Ltd. (B.S.A.) but the postwar slump quickly compelled its directors to close Airco down, making the D.H.18, which went into service with A.T. & T. in April 1920, not only Airco's first purely civil design but also its last.

The Formation of the Company

Not wishing to design cars for B.S.A., Geoffrey de Havilland left to found his own company and the de Havilland Aircraft Co. Ltd. was formed on September 25, 1920 with some finance from Holt Thomas and with himself as Director and Chief Designer. Key men from Airco who also joined as directors were C. C. Walker (Chief Engineer), F. T. Hearle (General Manager), W. E. Nixon (Secretary) and F. E. N. St. Barbe (Sales Manager). A. E. Hagg joined as Assistant Designer. They rented a large field at the end of a country road in Edgware known as Stag Lane, recently vacated by the London and Provincial Aviation Company's flying school, and on October 5 moved into its two wooden sheds, one of which is still preserved as a Museum just inside the main gate at Hatfield.

An immediate decision was taken to build mainly civil aeroplanes—a bold step indeed at a time when the market scarcely existed—and two half finished D.H.18s were brought over from Hendon. Others were then built for Daimler Hire Ltd. and Instone Air Line Ltd.; two D.H.14 day bombers were produced for the Air Council and 150 D.H.9As were refurbished for the R.A.F. but the firm's first entirely new aeroplane was the D.H.29 high-wing 12 seater. During his first test flight it was clear to Capt. de Havilland that there were stability problems with this unfamiliar layout and it was dropped reluctantly in 1922 in favour of a biplane equivalent, the D.H.34, and the Company did not build another high-wing transport until the D.H.95 Flamingo of 1938.

de Havilland's success with civil designs stemmed from the use of simplified structures in which the cabin, as in the D.H.18, 29, 34 and 50, was merely a plywood box without space-restricting internal bracing, coupled with progressive control system refinement which led to the invention of the



The Stag Lane factory in rural surroundings in 1923 with a D.H.18 on trestles (left) and one of the Flying School Avro 548s.

D.H. differential aileron. The Company's single engined transports petered out however when airlines began to demand two and three engined types in order to reduce the chances of forced landings, and ended with the single D.H.54 Highclere of 1925 and a few D.H.61 Giant Moths 1928–1929.

Hopes of lucrative military contracts during these lean years were killed by the rigidity of Air Ministry specifications which left designers little room for initiative and led to a crop of unimpressive aeroplanes. The rejection of his D.H.27, D.H.42 and D.H.56 military prototypes led de Havilland into the private venture field with the D.H.65 Hound and D.H.77 low-wing interceptor fighter of 1929. Both were faster than contemporary fighters but Air Ministry indifference eventually ended D.H. military aircraft aspirations for a decade.

1921 was memorable for the arrival of premium apprentice R. E. Bishop (responsible in later years for several famous designs, including the Comet jetliner) and of Alan S. Butler, wealthy owner of a private Bristol Tourer *G-EAWB*, who placed an order for a special three seat tourer to his own requirements. He backed this with an investment which enabled the Stag Lane site to be acquired outright from Messrs. Warren and Smiles, directors of London and Provincial, who were demanding that D.H. either purchase the leasehold or move out, and he was subsequently made Chairman of the Company. From 1924 until his retirement in 1950, thirtieth year of the de Havilland Enterprise, he remained a tower of strength to the Company.



Three prototypes outside the Stag Lane works in 1925—D.H.53 Humming Bird *G-EBHX*, D.H.60 Moth *G-EBKT* and D.H.51A *G-EBIM*.

Butler's D.H.37 flew in 1924, the year in which two D.H.52 gliders took part in the *Daily Mail* Gliding Competitions. They were followed in 1923 by two D.H.53 low powered single seaters for the Lympne Light Aeroplane Trials but neither won a prize and their performance, together with the results of the 1924 Air Ministry Trials for two seaters with engines under 1,100 cc., convinced Geoffrey de Havilland that machines of less than 50 h.p. were of little practical value. As no engine of this power existed, he approached Maj. F. B. Halford of the Aircraft Disposal Co. Ltd., Croydon, who designed the 60 h.p. four cylinder Cirrus, a brilliant improvisation which used low cost cylinders and other components from the firm's vast stock of war surplus Renault engines.

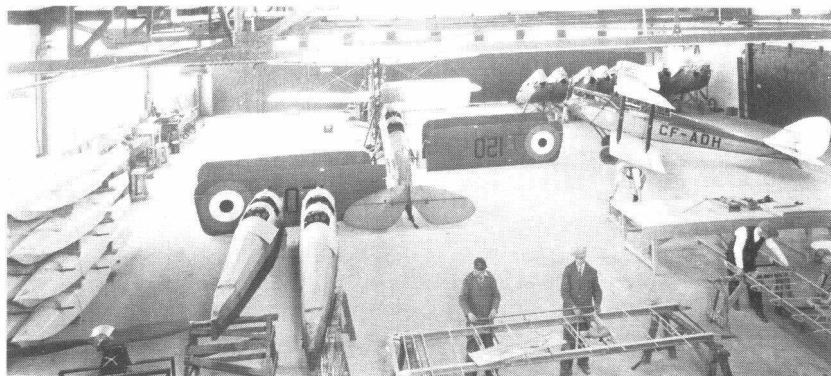


Refuelling a D.H.60 Moth at the Stag Lane 'aero-garage' in 1926. ('Flight' Photo 3924.)

With its simple lines, plywood construction, rugged reliability and the Cirrus engine, de Havilland's two seat Moth set a fashion in light aeroplane configuration which was often imitated but remained unsurpassed for over 20 years. It made the flying club movement possible, penetrated to all parts of the world in the hands of record breaking pilots and dramatically changed the fortunes of the company. To meet ever increasing Moth orders, additional workshops and flight sheds arose at Stag Lane, the main works at that time being preoccupied with contracts for three engined D.H.66s for Imperial Airways Ltd. and QANTAS. Training was available to would-be owners in the yellow painted Moths of the newly founded London Aeroplane Club under the all-seeing eye of the chief flying instructor, F. G. M. Sparks, and specially built Moth lock-up 'garages' were available when they qualified.



The Moth service station at Berlin/Tempelhof in 1929. Left: Cirrus Moth c/n 374, earlier delivered as *G-W101*. Right: Genet Moth *D-1651*, formerly *G-EBOU*.



British-built D.H.60M Moths being assembled by de Havilland Aircraft of Canada Ltd. in its newly opened erecting shop at Downsview, Toronto, in 1929.



Part of the all-de Havilland QANTAS fleet at Longreach in 1930. Left to right: Moth VH-UGH, Gipsy Moth VH-UQH, Puss Moth VH-UPA, Giant Moth VH-UJC and D.H.50J VH-UHE. (Shell Photo.)

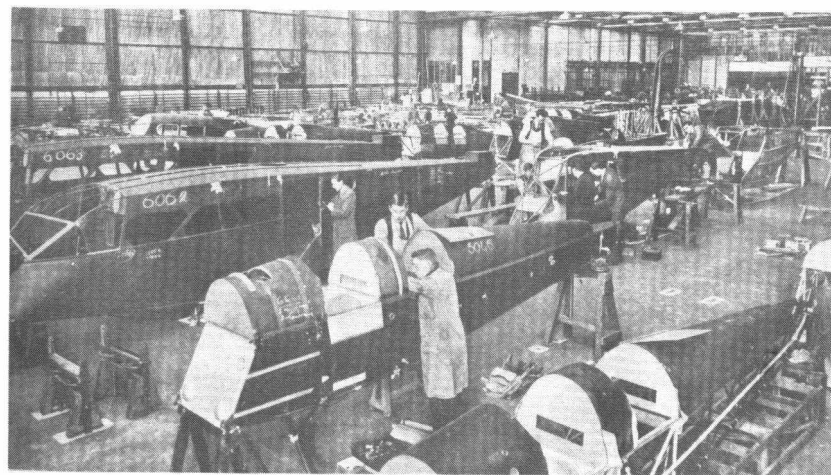
The Company started operations in Australia early in 1927 when Geoffrey's brother, Maj. Hereward de Havilland, shipped the Cirrus Moth *G-EBPP* to Perth and flew it to Melbourne where he proceeded to assemble imported Moths in a rented shed at the back of the town. The incorporation of de Havilland Aircraft Pty. Ltd. on March 7, 1927 was the beginning of a chain of overseas companies—de Havilland Aircraft of Canada Ltd. in 1928; of India in 1929; of South Africa in 1930; and of New Zealand in 1939.

Anxious to be independent of an outside firm which might not be able to maintain the supply, de Havillands decided to make its own engines and Halford joined them to design a new 100 h.p. unit. Tuned to give 135 h.p., it first flew in 1927 in the little D.H.71 monoplane in which Hubert Broad raised the Class speed record to nearly 187 m.p.h. Sales of the new Gipsy engine, as it was called, soon became big business and deliveries began on June 28, 1928 from a newly-built engine works in the south east corner of the aerodrome. Then, in 1929, the Gipsy was turned upside down and fitted into the new Puss Moth which, at the Olympia Aero Show, London, first introduced private pilots to cabin comfort.

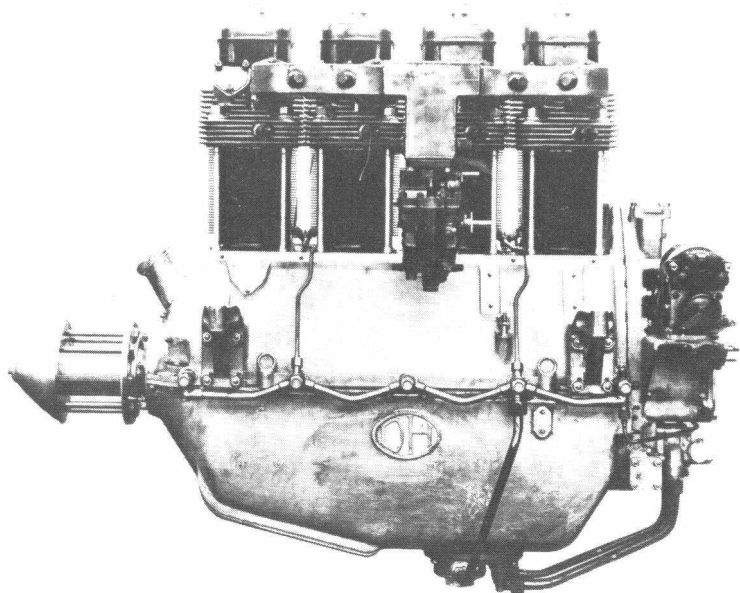
Farewell to Stag Lane

Although still in rural country, with Burnt Oak Station and 'The Bald Faced Stag' (the firm's 'local') as the only sizeable buildings in sight, Stag Lane was already doomed as an aerodrome because the extension of the Underground railway to Edgware changed the area into a London dormitory suburb and it was soon engulfed in a sea of houses. Consequently, in 1930, a new airfield site was acquired at Hatfield, Herts. and during the next 12 months the de Havilland School of Flying and the London Aeroplane Club moved out. By the end of 1932 the entire airframe factory had departed but not before the immortal Tiger Moth trainer, the Fox Moth light transport and the twin engined Dragon had been fairly launched. The aerodrome was closed officially by NOTAM No. 4 in January 1934 but the Engine Division remained. After the landing ground had been sold to the building contractors, the grass area gradually shrank until only a narrow strip remained from which the last machine—Hornet Moth *G-ACTA* piloted by Capt. Geoffrey de Havilland—took off for Hatfield on July 28, 1934.

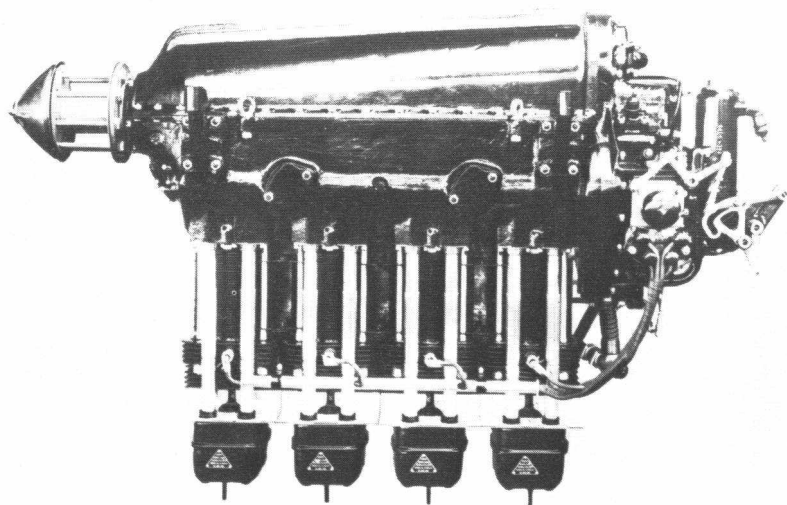
From Hatfield's new factory there emerged a growing stream of Tiger Moth and Moth Minor trainers; Leopard and Hornet Moth tourers; Dragon, D.H.86 and Rapide light transports; the Comet racers; the Albatross and Flamingo airliners; and finally 1,440 Airspeed Oxford twin engined trainers before the works was turned over to de Havillands' main contribution to the 1939–1945 war—the Mosquito. The vast wartime total of 6,710 of these high performance, multi-purpose combat aircraft, of over 20 marks, built by D.H. at Hatfield and in their new No. 2 Factory at Leavesden; by sub-contractors; and by the Canadian and Australian



Moth Major, Dragon, Leopard Moth and Fox Moth production during the final days at Stag Lane, with constructors numbers chalked on red doped fuselages.



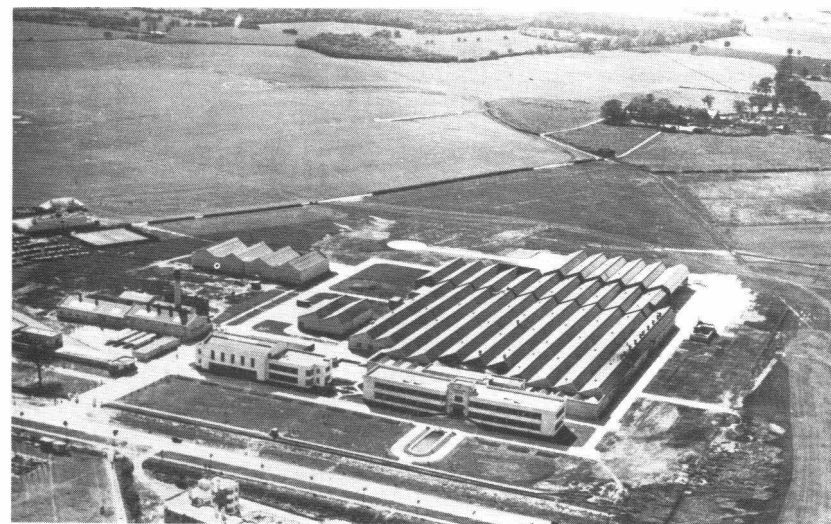
100 h.p. de Havilland Gipsy I.



120 h.p. de Havilland Gipsy III.

Companies, rose to 7,781 by the time production ceased in 1950. In addition the D.H. Repair Organisation repaired 2,962 Mosquitoes, Hurricanes, Spitfires and miscellaneous de Havilland types at Hatfield and Witney, Oxon.; and in 4½ years its Merlin Repair Dept. overhauled 9,022 of these engines.

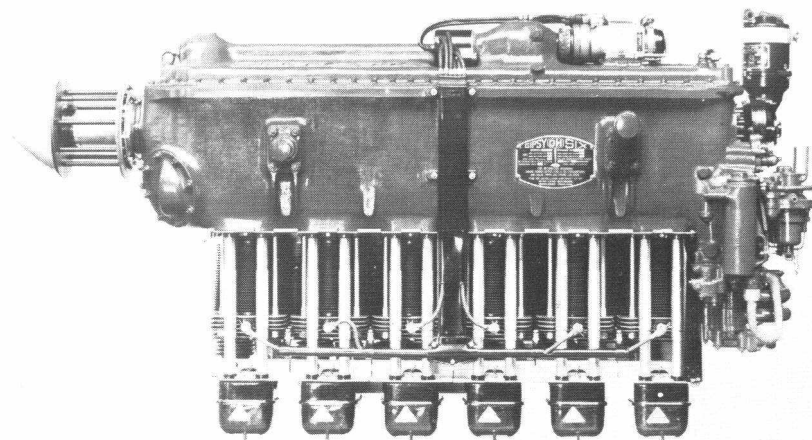
When the Comet racers drew attention to the advantages of variable pitch airscrews, de Havillands acquired a licence to manufacture the American-designed Hamilton propeller and equipped a factory at Stag Lane which began deliveries in July 1935. Over 102,000 were made during the war years, 23,210 of them at Stag Lane where the Engine Division (reconstituted as The de Havilland Engine Co. Ltd. in 1944) built 10,212



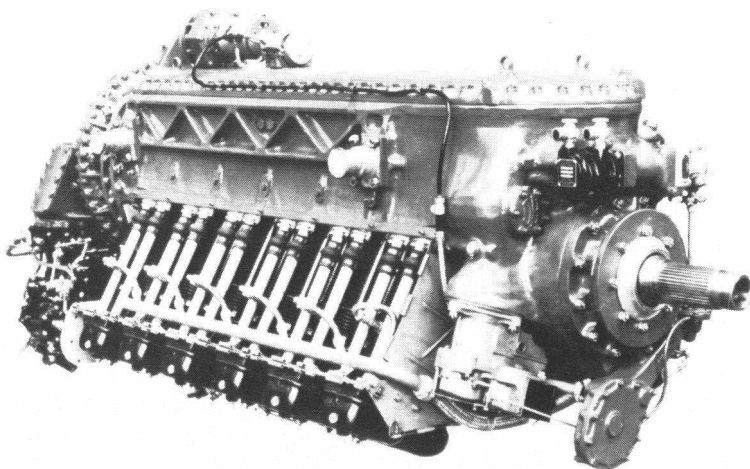
The new works at Hatfield in the 1930s when the aerodrome was still only a grass field.

Gipsy Major and Gipsy Queen engines over the same period. Over 8,000 Tiger Moths were built at home and abroad, nearly half by Morris Motors Ltd., Cowley, Oxon.; and 200 Rapides and Dominie navigation trainers were built at Hatfield. In 1943 production of these was transferred to Brush Coachworks Ltd., at Loughborough where another 275 were produced; while the associated Airspeed Company, taken over in 1940, built 4,462 Oxfords as well as 695 Horsa gliders.

The Mosquito was followed by a family of Vampire cannon-firing interceptors powered by F. B. Halford's Goblin turbojet engines, the Vampire prototype being flown on September 20, 1943, only 16 months after the go-ahead. It exceeded 500 m.p.h. in the spring of 1944 and was the first U.K. or U.S.A. aircraft to do so. The classically beautiful Merlin engined Hornet single seat fighter development of the Mosquito, first flown on July 28, 1944, was too late to join combat.



200 h.p. de Havilland Gipsy Six.



525 h.p. de Havilland Gipsy Twelve.



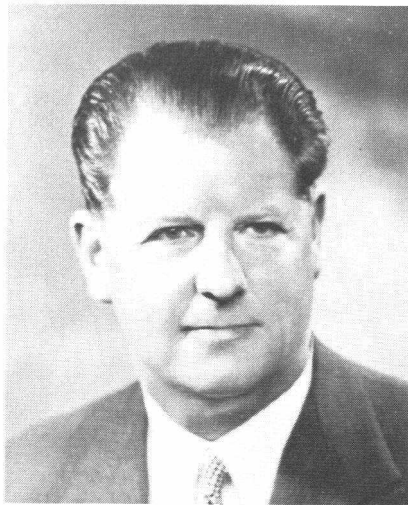
H.M. King George VI on a visit to Hatfield in 1940 accompanied by Mr. A. S. Butler, Chairman of the Company, with Sir Geoffrey de Havilland and Marshal of the Royal Air Force Sir Arthur Tedder in the rear.

After the War

Quick off the mark, the firm flew its all-metal Rapide replacement, the Dove, on its 25th anniversary, September 25, 1945, only six weeks after the end of hostilities. The Witney Repair Unit sold nearly 100 refurbished Rapides by February 1946 and production of the Vampire and its variants continued at the Preston works of the English Electric Co. Ltd. until greatly expanded by the acquisition of the former Shadow Factory at Hawarden, Chester, in 1948. During the next 11 years more than 3,500 aircraft were built there, including nearly 500 Doves and some 140 of its four engined development, the Heron.



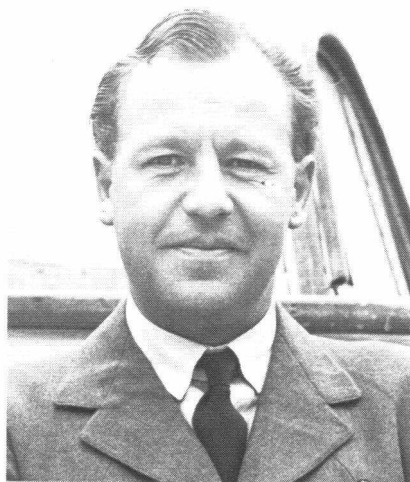
Mosquito production in the No. 2 Factory at Leavesden in 1943.



F. B. Halford.



R. E. Bishop.



Geoffrey de Havilland Jr.,
chief test pilot 1937-46.



Peter Buggé, chief development
test pilot.

The Vampire was followed by the Venom with Halford's bigger Ghost engine, by two seat variants of both, and by the Sea Vixen all-weather naval fighter. The Ghost powered the D.H.108 tailless research monoplanes and the early Comet airliner with which B.O.A.C. made the world's first revenue earning jet flight in May 1952. Disasters which overtook both these types contributed to a wider knowledge of compressibility and fatigue problems and paved the way for highly reliable Comets of later marks, the

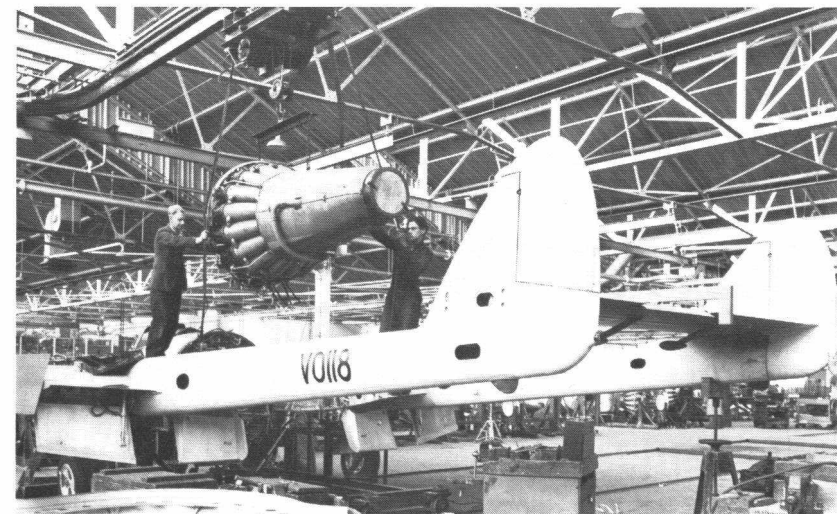
second generation Trident short-haul transports and the D.H.125 executive jets.

The later Gyron turbojet gave no less than 29,000 lb. of thrust with reheat and the scaled-down Gyron Junior, first run in 1955, the year in which Halford died, was used in the Blackburn Buccaneer S.Mk.1 naval strike aircraft and the experimental Bristol 188. Then came the Sprite and Spectre assisted take-off rocket motors and finally the Gnome turboshaft engine which was widely used in the helicopter field.

de Havilland Propellers Ltd., formed as a separate company in 1946 with a new factory at Hatfield, produced airscrews for most postwar transports and later designed and manufactured Firestreak and Red Top air to air missiles. It also carried the major design responsibility for the Blue Streak long range ballistic missile project.

The D.H.125 was the last aeroplane type sold under the familiar D.H. label before the de Havilland Enterprise, by then employing some 37,000 people, was absorbed into the Hawker Siddeley Group in 1960.

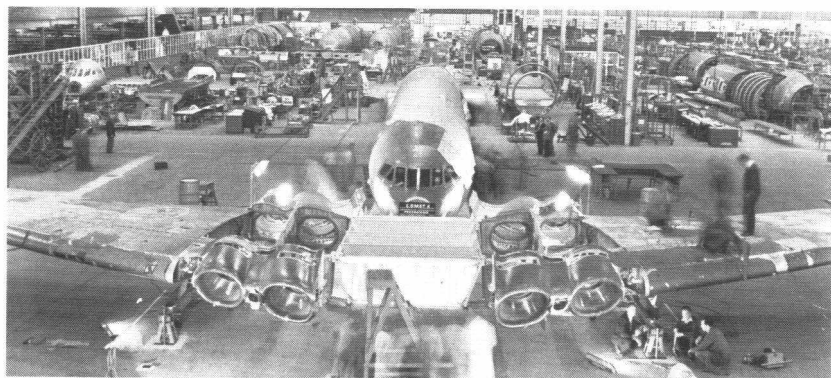
Writing in 1961, Lord Brabazon of Tara commented 'Sir Geoffrey de Havilland looks very much the same as when I first met him at Seven Barrows in 1910—slim, soft spoken, quiet, and with that simple faith that moves mountains.' Certainly his name stood out conspicuously and consistently during a long life of service to British aviation for which he was knighted in 1944, and there is no doubt that his skill as an active pilot for over 40 years had a great deal to do with his outstanding success as a designer. He made an aeroplane and taught himself to fly it in 1910; made all the first flights of his 1914-1918 military aircraft and early postwar prototypes; in 1922 his personal D.H.6, *G-EAWD*, was one of Britain's



Hoisting the Goblin engine into a new Vampire airframe. (Central Press.)



John Cunningham (*left*), chief test pilot since 1946, on the flight deck of the first B.O.A.C. Comet 4, *G-APDA*, with chief production test pilot W. P. I. Fillingham in the co-pilot's seat.



Comet 4 production at Hawarden in 1958.



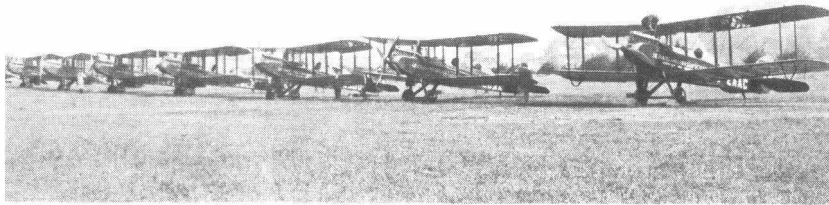
Heron 1s, constructors numbers 14015, 14017 and 14019 for Indonesia and Uruguay, under construction at Hawarden in 1953.

first private aeroplanes; and between 1927 and 1930 he owned Moths *G-EBSF* and *G-AAAA*. He then flew Puss Moth *G-ABGT* until it was replaced in 1933 by the prototype Leopard Moth with personalised registration *G-ACHD* and occasionally by *G-ACKP*. In 1938, with F. T. Hearle as passenger, he delivered the Rapide *VP-KCL* from Hatfield to Wilson Airways Ltd. at Nairobi, Kenya, and he retained a current flying licence until his last solo flight in the Leopard Moth *G-ACHD* on August 14, 1952. Over the years he used all these aeroplanes, as well as the company's Hornet Moth *G-ADMT*, for weekend visits to 'the aeroplane field' near his old home at Crux Eaton where he taxed them into a small fenced enclosure to protect them from farm animals.



The 'old guard' with the prototype D.H.53 outside the museum hut at Hatfield on the occasion of the 40th anniversary of the founding of the Company in September 1960. *Left to right*: Sir Geoffrey de Havilland, W. E. Nixon, F. T. Hearle, C. C. Walker, Sir Alan Cobham, A. E. Hagg and H. S. Broad. (*A. J. Jackson Photo.*)

In September 1960 Sir Geoffrey met members of his original team, his former chief test pilot H. S. Broad and the veteran de Havilland trail blazer Sir Alan Cobham at Hatfield to celebrate the 40th anniversary of the founding of the Company. As they foregathered outside the wooden hut which, in its Stag Lane days, had been their headquarters for so long there came a moment of pure nostalgia as test pilot Chris Capper flew round in the 37 year old D.H.53 Humming Bird prototype *G-EBHX* which had just been made airworthy by apprentices of the de Havilland Aeronautical Technical School for the Shuttleworth Trust. It was one of Sir Geoffrey's few public appearances and he died in retirement on May 26, 1965.



The de Havilland Aeroplane Hire Service fleet of D.H.9B and D.H.9C aircraft lined up at Stag Lane in 1922.

The de Havilland Aeroplane Hire Service

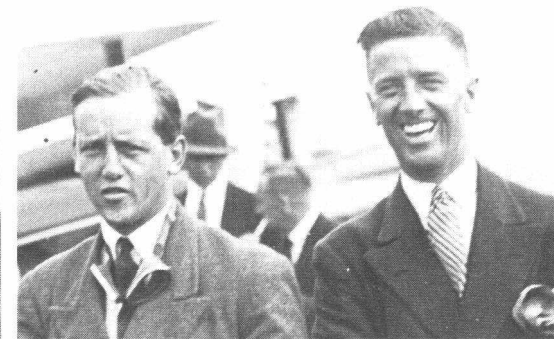
In 1921 the Company decided to embark on enough commercial flying to provide practical experience for their future designs and set up its own private hire service. This also met growing demands by Aerofilms Ltd., specialists in the air-to-ground photography of factories, public buildings and the like; by newspapers and film companies who wanted reporters, photographic plates or exposed ciné film rushed back from sporting events, disasters or State functions; by jockeys or by wealthy people in a hurry.

Chief pilot and manager was A. J. Cobham who had been flying for the aerial photography department of the old Airco company. He ferried all his old photographic Siddeley Puma engined D.H.9s over from Hendon to Stag Lane and these formed the nucleus of the new de Havilland Aeroplane Hire Service. His staff included H. S. Broad (who arrived at Stag Lane in his own Sopwith Camel *G-EAWN* on October 7, 1921), W. L. Hope, F. J. Ortweiler, C. D. Barnard and R. E. Keyes. The fleet grew to nine aircraft, modified gradually into D.H.9B and 9C four seaters, joined in 1923 by two D.H.16s, *G-EALM* and *'PT'*, which had survived the Aircraft Transport and Travel Ltd. operations in 1919–1920.

The aircraft were in almost daily demand for flights from Stag Lane to Britain's major cities and the first long distance charter came in August 1921 when Cobham made a 5,000 mile trip round Europe with a wealthy American, Lucien Sharpe, in the D.H.9C *G-EAYT* 'Atlanta'. He flew the Hire Service D.H.9C *G-EBAW* in the 1922 King's Cup Race and in the following autumn took the same American through Spain, Morocco, Algeria and Tunisia, again in *G-EAYT*. The flight continued across the Mediterranean to Italy but ended when Cobham made a precautionary landing on the water only a mile or so from destination when Venice Lido aerodrome was suddenly blanketed by fog. Cobham later took a Hire Service D.H.9B to Belgrade to bring back urgent *Daily Mail* photographs of a royal wedding and flew back through the night to a landing at



Alan J. Cobham, Hire Service Manager.

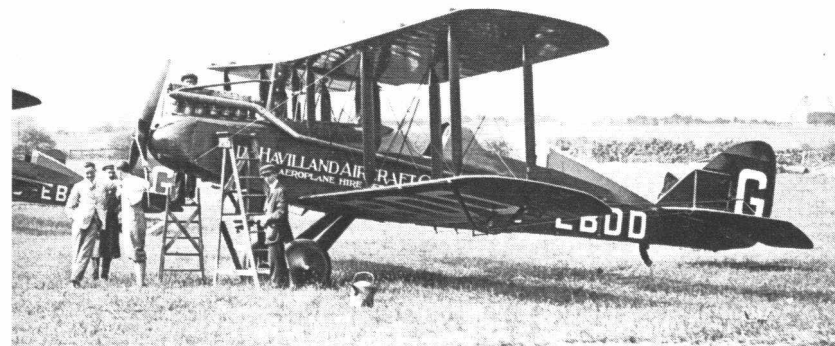


Air taxi pilots: (left) Hubert S. Broad and (right) Walter L. Hope.

Penshurst in fog early the next morning—no mean feat in an open cockpit without radio or navigational aids.

Between February and May 1923 Cobham made an outstanding 11,000 mile flight from Stag Lane to Palestine and Egypt in the ever-green D.H.9B *G-EAAC* which included a complete circumnavigation of the Mediterranean. Sharpe was again the charterer and at the end of the flight the Royal Aero Club awarded Cobham the Britannia Trophy.

After R. E. Keyes was killed in the D.H.16 *G-EALM* which spun in at Stanmore, Middlesex, during a test flight on January 10, 1923, its stable mate *G-EAPT* was withdrawn from use. The fleet had flown more than 1,500 charter hours but the demand for Hire Service aeroplanes was already on the decline and during 1923 the surviving D.H.9 variants were turned over to training and transferred to the de Havilland School of Flying. They were borrowed occasionally when charter flights were called for but the Hire Service was without aircraft of its own until allotted the first three D.H.50s, *G-EBFN* "Galatea", *'FO'* and *'FP'* in the following year.



The Aeroplane Hire Service D.H.9C *G-EBDD*.

In 1925, following a crash landing in which the Puma engine was torn from its mountings, *G-EBFO* was re-engined with a 385 h.p. Armstrong Siddeley Jaguar radial and departed for the Cape on the first of Cobham's long distance air route survey flights. This marked the end of all Hire Service operations. W. L. Hope left to form his own Stag Lane-based Air Taxis Ltd.; C. D. Barnard took up an appointment as personal pilot to the Duchess of Bedford; and H. S. Broad became chief test pilot to the de Havilland Aircraft Co. Ltd. Charter work was thereafter in the hands of Air Taxis Ltd. with Moths and the D.H.50 *G-EBQI*; and at Croydon by the private hire department of Imperial Airways Ltd., managed by Capt. G. P. Olley and using D.H.50s *G-EBFP* and 'KZ'.

Fleet List 1921–1925

D.H.6 *G-EANU*, *G-EAWD*
 D.H.9B *G-EAAC* "Antiopa"
 D.H.9C *G-EAXG*, *G-EAYT* "Atlanta", *G-EAYU*, *G-EBAW*, *G-EBAX*, *G-EB CZ* "Arion",
G-EBDD, *G-EBEZ* "Eileen", *G-EBGT* "Nulli Secundus", *G-EBGU* "Atmalia"
 D.H.16 *G-EALM*, *G-EAPT*
 D.H.50 *G-EBFN* "Galatea", *G-EBFO*, *G-EBFP*

The de Havilland School of Flying

Soon after the 1914–1918 war four flying schools were established at which R.A.F. Reservists could put in their annual flying hours and the first was opened by de Havillands on April 1, 1923 with two D.H.6s and four Avro 548s as primary trainers. These were supplemented by seven of the D.H. Aeroplane Hire Service D.H.9 variants for advanced flying and, when the Hire Service closed, its aircraft went over entirely to school work. The other Reserve Schools were run by the Armstrong Whitworth, Beardmore and Bristol companies at Whitley, Renfrew and Filton respectively.

The first Chief Instructor at Stag Lane was named Edelston. He was followed by E. B. Wilson and then by Flt. Lt. A. S. "Jimmy" White, A.F.C. who held the post until 1928 when he was succeeded by Flt. Lt. R. W. Reeve, D.F.C., M.M. who had come from Beardmores in 1925. The instructional staff at this time included J. V. Holman, C. E. F. Riley, P. P. Grey, C. D. Barnard and C. A. Pike who ran the School after R. W. Reeve left to become C.F.I. of de Havillands' second flying school at White Waltham in 1935.

By 1926 all primary training was done on Moths and in the same year the veteran D.H.9s were modernised and re-engined with Armstrong Siddeley Jaguar radials as D.H.9Js by the School's engineers, several of whom were to hold high office in the Industry. The Chief Engineer, H. M. Woodhams (holder of Ground Engineer's Licence No. 2), later became Managing Director of Armstrong Whitworth Aircraft Ltd., while his assistants, R. E. Hardingham and James Norman joined the Air Registration Board as



The School fleet in 1923. Left to right: Avro 548 *G-EBFM*, five Hire Service D.H.9Bs and 9Cs, and D.H.6 *G-EANU*. ('Flight' Photo 2447.)

Secretary (and later Chief Executive), and Chief Surveyor, respectively when it was formed in 1937. S. T. Weedon, one of the fitters who constructed the first hand-made Gipsy engine, became Chief Engineer of the School in 1935.

Among the first Reservists to fly at Stag Lane were A. G. Lamplugh (British Aviation Insurance Group); H. Duncan Davis (Brooklands School of Flying); J. G. Weir (Weir Autogyros); W. W. Wakefield (England Rugby Captain); and J. F. X. McKenna who became one of the R.A.F.'s foremost aerobatic pilots and, during the 1939–1945 war, Commandant of the Empire Test Pilots' School at Boscombe Down. Capt. Geoffrey de Havilland's sons Geoffrey and Peter, who learned to fly at the School, were later joined in the Reserve by their brother John after he had obtained an A Licence at the London Aeroplane Club.

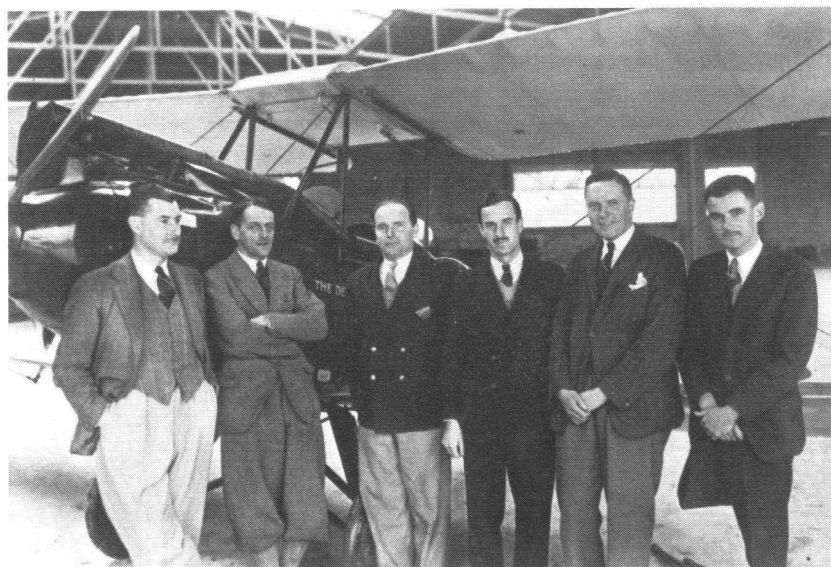


D.H. management staff and instructors in 1928. Left to right: W. T. Ballantyne, C. A. Pike, F. E. N. St. Barbe, R. Malcolm, W. E. Nixon, A. S. White, R. W. Reeve, G. H. Allison, E. Fulford and two unknown. ('Flight' Photo 6491.)

Extra curricula activities undertaken by the School instructors included flight testing the wing flaps intended for the D.H.50 and D.H.51 in the D.H.9C *G-EBAW* in 1923; development tests on wing flaps fitted to Bristol Fighter *J6721* in 1926; distribution of newspapers to the provinces during the 1926 general strike; development flying on behalf of Rolls-Royce Ltd. of the prototype F engine installed in their own D.H.9A, *J8110*, from its first flight at Stag Lane on November 11, 1927 until Broad delivered it to Brooklands on May 27, 1929; production test flying of new Moths; and supplying relays of pilots for the 600 hour Gipsy engine endurance test in 1929.

A flourishing civil side to the School was established which trained a long list of distinguished pilots, many of whom became record breakers, test pilots, airline captains and even Directors of Civil Aviation abroad. In 1930, when the whole School moved to Hatfield and Rivers Oldmeadow came from Brooklands to be Chief Ground Instructor, the fleet consisted of at least seven Gipsy Moths as well as seven D.H.9Js but when the latter were scrapped in 1933, all were replaced by Tiger Moths. These commenced with *G-ACDA* and were painted in the School's familiar deep red and silver livery, perpetuated after the 1939–1945 war by the Tiger Club's venerable *G-ACDC*.

The training syllabus now included advanced navigation, instrument flying, aerobatics, gunnery and photography, and when the Expansion Scheme began in 1935 the School became No. 1 Elementary Flying



The instructors in 1930. Left to right: R. L. Palmer, G. M. Cox, E. Fulford, R. W. Reeve, C. A. Pike and Rivers Oldmeadow (Ground Instructor). (*D.H. Gazette*.)



de Havilland School of Flying Tiger Moths at Hatfield in 1937.

Training School and provided training for pilot entrants to the R.A.F., and from 1937, annual Reserve training on Hawker Harts. The second School, opened by R. W. Reeve at White Waltham in November 1935 with Tiger Moths commencing *G-ADHR*, became No. 13 E.F.T.S. and trained 600 pilots before the aerodrome was handed over to Air Transport Auxiliary on January 11, 1941. The de Havilland Company also operated 90 R.A.F. Tiger Moths at No. 17 E.F.T.S., North Luffenham, 1941–1942.

At the outbreak of war in 1939 the Harts returned to the R.A.F., leaving the Hatfield School with 17 Tiger Moths which quickly increased to 54. Flying staff were given R.A.F. rank and in 1941, when there were 42 instructors, 180 pupils and 90 Tiger Moths on strength, the School flew the immense total of 43,693 hours. To achieve this, a relief airfield was opened at Holwell Hyde (later known as Panshanger), four miles north east of Hatfield. Eventually, on September 7, 1942, the whole School moved there to clear Hatfield for all-out Mosquito production. Five Percival Proctors were also added at this time to provide air experience for Link Trainer instructors under training.

When the war ended the School returned to Reserve flying but this was gradually run down until only a handful of R.A.F. Tiger Moths were left, and it closed at the end of its thirtieth year of operation, on March 31, 1953.

Fleet List 1923–1939

D.H.6	<i>G-EANU, G-EAWD</i>
Avro 548	<i>G-EAAL, G-EBAG, G-EBFM, G-EBHL</i>
D.H.9J	<i>G-EAAC, G-EBEZ, G-EBFQ, G-EBGT, G-EBTN, G-AASC, G-ABPG</i>
D.H.60 Moth	<i>G-EBMO, G-EBMV, G-EBOS, G-EBOT, G-EBPG, G-EBZS</i>
D.H.60G Gipsy Moth	<i>G-AADI, G-AAEO, G-AAFS, G-AAKM</i>
D.H.60M Moth	<i>G-AACD, G-AACU, G-AASL, G-ABCH, G-ABHN, G-ABNE</i>
D.H.82A Tiger Moth	<i>G-ABRC; G-ACDA to G-ACDC; G-ACDE to G-ACDK; G-ADCG, G-ADCH; *G-ADHR to G-ADHW; *G-ADHY to G-ADIC; *G-ADKG; *G-ADLV to G-ADLX; G-ADLZ and G-ADMA; *G-ADSH; G-ADXB to G-ADXE; G-ADXI, G-ADXJ; *G-AELP; G-AEMF; G-AEVB; G-AFGY, G-AFGZ; G-AFJK</i>

Note: *Based initially at White Waltham but there were frequent short term Tiger Moth exchanges with Hatfield.



Gipsy Moth *G-ACAM* which the de Havilland Aeronautical Technical School built in 1933. *G-ACBA*, first Tiger Moth for the Bristol Reserve School awaits delivery in the background. ('The Aeroplane' Photo.)

The de Havilland Aeronautical Technical School

The 'Tech School', as it was always known, came into being in 1928 when expansion of the firm due to the commercial success of the Moth, made it advisable to develop the existing apprentice scheme to include a wide variety of practical and theoretical engineering subjects. An evening technical institute was established at Stag Lane with A. T. Eadon as Principal and staffed by de Havilland designers, aerodynamicists and stressmen who trained students up to A.F.R.Ae.S. standard and beyond.

The first 'workshop' was just a corner of a maintenance shop but later a complete building was allocated with little in it apart from benches. A lorry was therefore despatched to the Aircraft Disposal Co. Ltd. at Croydon which, for instructional purposes, brought back a stripped Avro 504K airframe and single examples of the Rolls-Royce Eagle, Napier Lion and Gnome monosoupape engines. As a first major exercise students rebuilt the fuselage of a crashed Moth as a test bed for the Cirrus and Gipsy engines which they had overhauled. It was later fitted with wings as a rigging exercise and eventually, with the top wing removed, was used for giving taxiing experience but even then showed a distinct tendency to leave the ground.

A complete D.H.9J, *G-ABPG*, was built as a full-scale exercise in 1931 and with the benefit of lathes and welding equipment acquired in 1932, the School constructed a hand-made Gipsy Moth, *G-ABTS*. This was powered by a non-standard Gipsy I built up from carefully matched, factory-made

parts which were outside permitted tolerances. Many students learned to fly on it and when its popularity passed the 1,000 instructional hour mark in 1933 a second machine, *G-ACAM*, was built with a standard engine. In 1934 *G-ACAM* was sold to the Govan brothers, two graduates of the School who flew it home to Delhi. In the same year and at a time when Tiger Moth production was almost entirely earmarked for the new Reserve Schools, students built a much needed extra example, *G-ACPS*, for the London Aeroplane Club followed by *G-ADGO* in 1935 and *G-AEVB* for the de Havilland School of Flying in 1936. The last Hatfield-built wooden biplane was Moth Major *G-ADIO* built by the School in 1935.

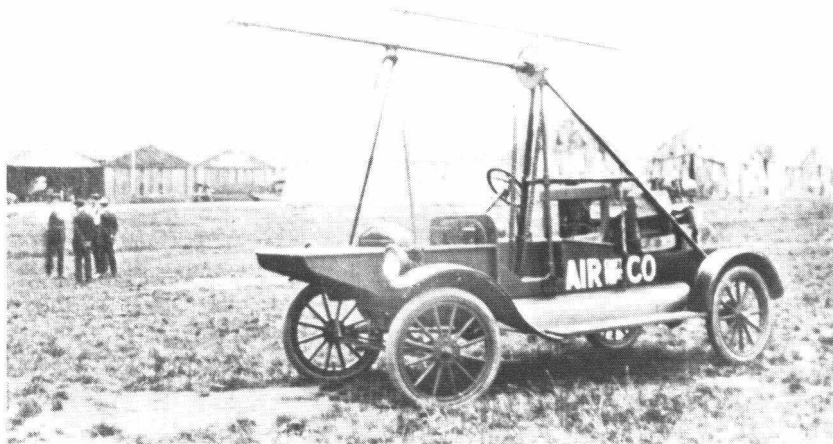
The School was extended at this time to include design and drawing departments which enabled students to design their first original full sized aeroplane and subsequently to build it. This was the Gipsy powered T.K.1 two seat biplane in which Geoffrey de Havilland Jnr. came 5th in the 1934 Kings Cup Race. It was followed by the T.K.2 low-wing racer; the unbuilt T.K.3 project; the T.K.4 racer of 1937 (probably the smallest and most advanced aeroplane of its day); and the T.K.5 canard.

At the outbreak of war, part of the School was occupying the former Moth Minor erecting shop at Hatfield but this was completely destroyed when a Ju 88 bombed it on October 3, 1940. R. W. Reeve returned from



Sir Geoffrey de Havilland in the shadow of the 'Tech. School'-built Wright Biplane replica at the Science Museum, London, on April 25, 1951 during the handing-over ceremony of the 12 h.p. Wright engine replica which students had also made and test run.

(D.H. Gazette.)



One of Airco's original Hucks Starters at Hendon in 1919, similar to that which students rebuilt for the Shuttleworth Trust in 1953. (*W. K. Mackenzie.*)

White Waltham to take over as Principal in 1941 and after the de Havilland Experimental Department moved out of Salisbury Hall, London Colney, and vacated the two hangars on the estate in which the two prototype Mosquitoes had been built, the School moved in and remained for eight years.

During this period the original Wright Biplane became due for return to the United States after many years on exhibition at the Science Museum, London, and the School was invited to build an accurate replica to replace it. Work started in March 1946 and the completed aircraft, with its



The Technical School's Druine Turbi, G-AOTK, in 1958 colours. (*A. J. Jackson Photo.*)

uncanny look of antiquity and unbelievably convincing dummy engine, was handed over to the Museum two years later by Sqn. Ldr. Reeve in the presence of Sir Geoffrey de Havilland, F. T. Hearle and those who had made it, on October 29, 1948. A working replica of the Wright brothers' 12 h.p. water-cooled engine was a later project which ran quite successfully on the test bench before it was also presented to the Museum by Sir Geoffrey on April 25, 1951. In 1953 the students reconditioned a vintage Hucks starter, once Airco's at Hendon and later a piece of Stag Lane's early equipment, which was presented to the Shuttleworth Trust at Old Warden.

When the School transferred to purpose-built accommodation at Astwick Manor, Hatfield, opened by Lord Salisbury on June 18, 1949, the curriculum expanded considerably into design, production and maintenance courses backed up by practical experience in the adjacent factory but no more full scale construction was undertaken by students. Flying instruction was given on the three Tiger Moths and on two Hornet Moths of the London Aeroplane Club, Panshanger, where, in those days, students accounted for 60% of the Club's flying hours and D.H. employees a further 20%.

In 1951 the School overhauled the Company's 1925 Cirrus Moth G-EBLV and in 1960 restored the Shuttleworth Trust's prototype D.H.53 Humming Bird G-EBHX. Thus rejuvenated, and flown initially by Clem Pike and Chris Capper, they gave modern generations an annual insight into the carefree light aeroplane flying of long ago to emulate which, after a lapse of many years, the School was already building an aeroplane of its own. This time it was a French-designed Druine Turbi open cockpit two



Students loading the fin which they had built for Lord Ventry's airship "Bournemouth" in 1950.

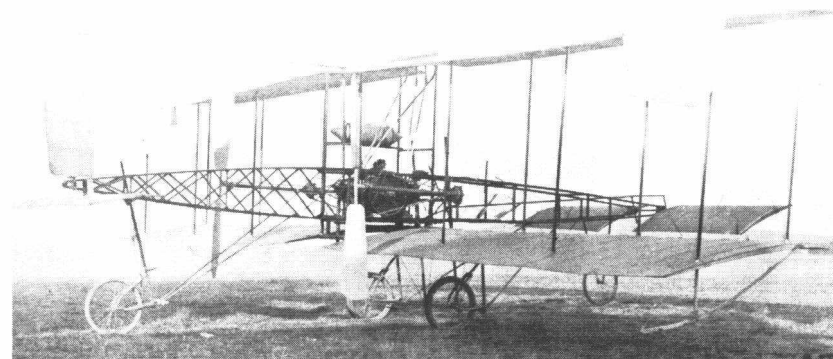
seater with 62 h.p. Walter Mikron engine which the students built in their spare time over a two year period and first flown by W. P. I. Fillingham at Hatfield on May 9, 1958. Appropriately registered *G-AOTK* to follow the tradition set by the pre-1939 series of T.K. aircraft, the Turbi was still providing cheap flying for students at Hatfield in 1987.

A working replica of the 1909 de Havilland engine which flew successfully in 1910 was another of the School's inspired projects which Sir Geoffrey de Havilland started up and set running at a ceremony at the Leavesden works of the de Havilland Engine Co. Ltd. on November 13, 1961.

**Aircraft built by the de Havilland
Aeronautical Technical School 1931-1958**

(excluding the T.K. series for which see pages 525-527)

<i>G-ABPG</i>	D.H.9J (c/n 1900), C. of A. 14.10.31, operated by the de Havilland School of Flying at Hatfield; scrapped in 1933
<i>G-ABTS</i>	D.H.60G Gipsy Moth (c/n 1900), C. of A. 21.3.32, operated by the D.H. Technical School; to Southend Flying Services Ltd., Rochford 11.33; to Brooklands Flying Club 2.36; impressed 6.40 as <i>AW135</i> ; damaged beyond repair at Hawarden 29.11.40
<i>G-ACAM</i>	D.H.60G Gipsy Moth (c/n 1915), C. of A. 25.1.33, operated by the D.H. Technical School; flown to India by the Govan brothers; re-registered 6.34 as <i>VT-AFJ</i>
<i>G-ACPS</i>	D.H.82A Tiger Moth (c/n 1993), C. of A. 19.4.34, London Aeroplane Club, Hatfield; sold in France 6.37 as <i>F-AQDP</i>
<i>G-ADGO</i>	D.H.82A Tiger Moth (c/n 2262), C. of A. 20.2.35, London Aeroplane Club, Hatfield; withdrawn from use 3.40
<i>G-ADIO</i>	D.H.60GIII Moth Major (c/n 2263), C. of A. 12.6.35, The de Havilland Aircraft Co. Ltd.; sold to the Austrian Aero Club 7.35 as <i>OE-DIO</i>
<i>G-AEVB</i>	D.H.82A Tiger Moth (c/n 2264), C. of A. 8.4.37, operated by the de Havilland School of Flying; impressed 10.40 as <i>BB739</i>
<i>G-AOTK</i>	Druine D.53 Turbi (c/n PFA.230), first flown 9.5.58, C. of A. 13.8.59, The T.K. Flying Group, Hatfield



de Havilland's first biplane at Seven Barrows in 1909. (By courtesy of Philip Jarrett.)

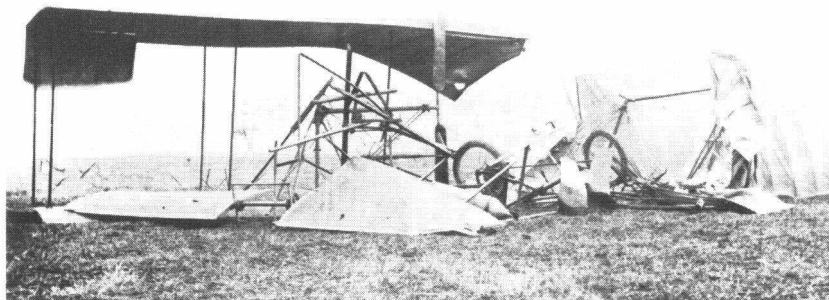
De Havilland Biplane No. 1

This was a single seat biplane of cotton covered, white wood construction with a fixed tailplane, front elevator, uncompensated ailerons, a large rudder above the tailplane but no fixed fin. It was braced with piano wire and mounted on an undercarriage of bicycle tubing with four bicycle wheels. The pilot sat in a wicker chair with a lever on the left which controlled the elevator, one on the right which moved the rudder, and a footbar connected to the ailerons.

The four cylinder, horizontally opposed, water-cooled engine, designed by Geoffrey de Havilland and made by the Iris Motor Company at Willesden, developed 45 h.p. at 1,500 r.p.m. It weighed 2 cwt. and was mounted at right angles to the direction of flight in order to drive two pusher propellers with adjustable aluminium blades through steel shafting and bevel gears.

There were no working drawings but the aircraft was completed from rough sketches early in 1909 in a rented workshop off Bothwell Street, Fulham, London, with the assistance of F. T. Hearle and of Mrs. de Havilland who sewed on the cotton covering. In May 1909 it was taken on a Commer lorry to Seven Barrows near Newbury, Berks. but over six months elapsed before undercarriage, propeller drive, engine and control adjustments were finished so that fast taxiing could be attempted whenever the wind was calm.

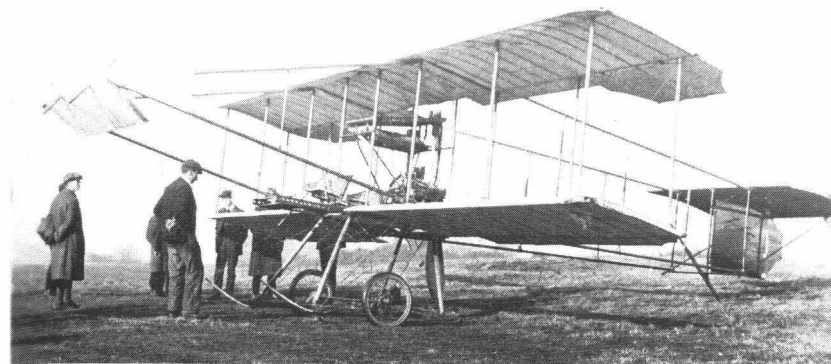
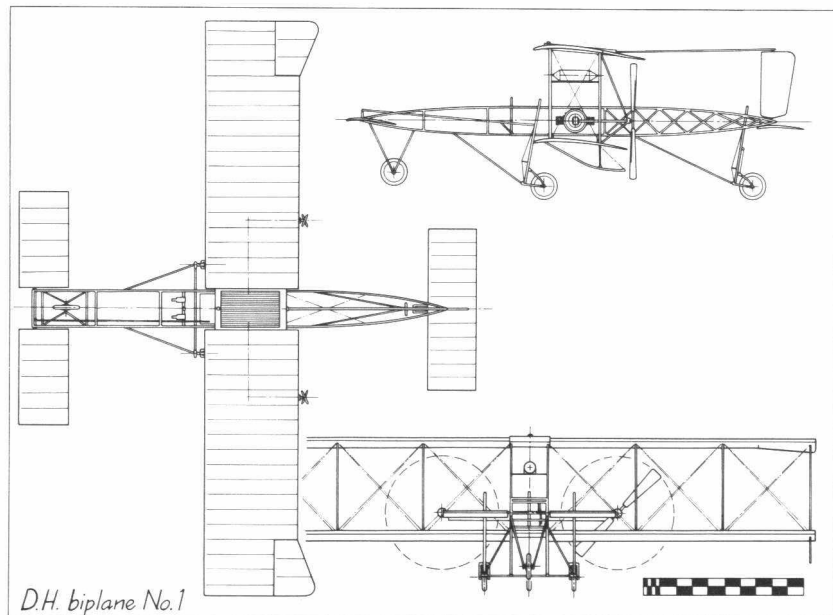
It flew for the first and only time in December 1909 after a downhill take-off into wind. Without pilot training and deprived of instinctive control by his complex system of levers, de Havilland overcorrected when he felt himself airborne and pulled the nose up so steeply that the wing spars failed and the aircraft broke up when it crashed from a height of 15 ft. The designer was uninjured and the engine was salvaged.



The remains of Biplane No. 1 after its crash in December 1909. (By courtesy of Philip Jarrett.)

SPECIFICATION AND DATA

Construction: By G. de Havilland and F. T. Hearle at Bothwell Street, Fulham, London, S.W.6
Power Plant: One 45 h.p. de Havilland/Iris
Dimensions: Span 36 ft. 0 in. Length 29 ft. 0 in.
 Wing area 408 sq. ft.
Weights: All-up weight 850 lb.



de Havilland's second biplane.

De Havilland Biplane No. 2

A two seater of spruce and ash construction with interconnected tail and front elevators, balanced ailerons and simplified undercarriage, built in the same Fulham workshop. The engine, salvaged from Biplane No. 1, drove a single pusher propeller and a first successful flight of $\frac{1}{4}$ mile was made by de Havilland at Seven Barrows on September 10, 1910.

In December it went by road to Farnborough where, after a one hour acceptance flight on January 14, 1911, it was purchased by the War Office for £400 and restyled F.E.1 (Farman Experimental). It was repeatedly modified and de Havilland flew it on March 31 with a larger tailplane and rear elevator; and again on April 11 with wing and aileron extensions, 65 sq. ft. in area, which were removed and refitted several times.

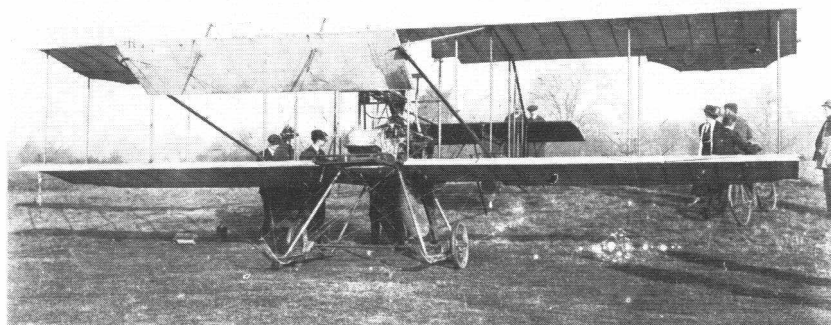
Trials over the measured course on Laffan's Plain on May 15 gave the maximum speed as 38 m.p.h. but with the extensions fitted, aileron drag made the aircraft unstable in yaw, partially cured on May 26 by installing new rudders above and below the tailplane. It flew again on July 3 with the front elevator removed but this pushed the CG too far back, corrected next day by moving back the upper mainplane.

Geoffrey de Havilland carried many passengers in this aircraft, including Harold Bolas and Lt. J. T. Ridge on May 5. He completed 80 miles of circuit flying with 17 officers and men of the London Balloon Company on July 28 and three days later reached an altitude of 1,000 ft. On August 2 he flew to Laffan's Plain with Lt. Ridge who then taxied the machine and flew a few yards. During his next lesson on August 5 the aircraft nosed over in a freshening wind but when Lt. Ridge took it out again on August 15 after

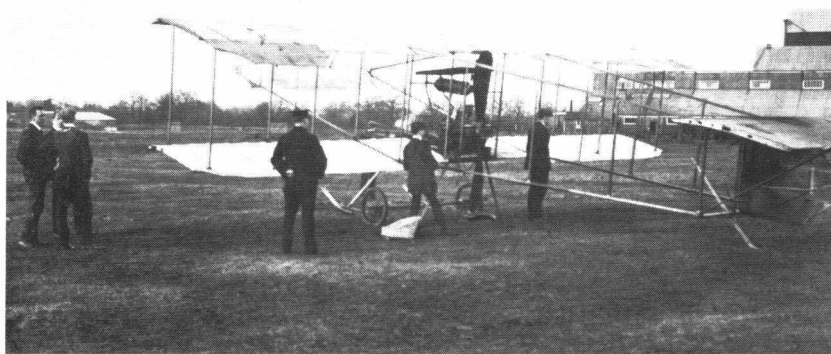
repairs, a broken bolt loosened two cylinders. The historic engine was beyond repair and the aircraft did not fly again.

SPECIFICATION AND DATA

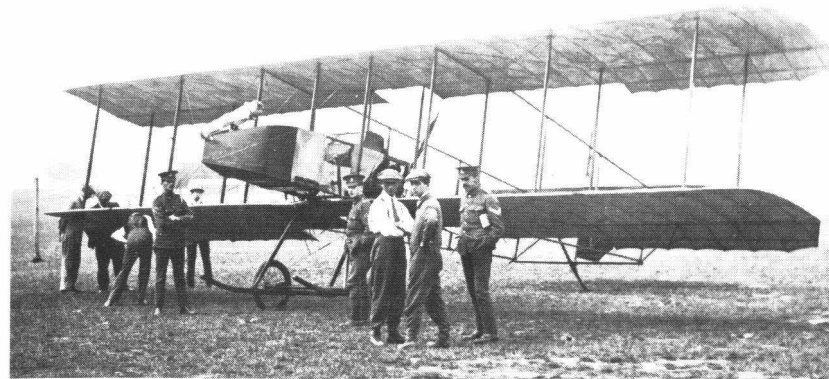
Construction: By G. de Havilland and F. T. Hearle at Bothwell Street, Fulham, London, S.W.6
Power Plant: One 45 h.p. de Havilland/Iris
Dimensions: Span 33 ft. 6 in. Length 29 ft. 0 in.
Wing area 356 sq. ft.
Weights: All-up weight 1,000 lb.
Performance: Maximum speed 38 m.p.h. Endurance 1 hour 20 minutes



Biplane No. 2 at Farnborough in 1911 after redesignation to F.E.1.



View of the F.E.1 showing the attachment points for the wing extensions.



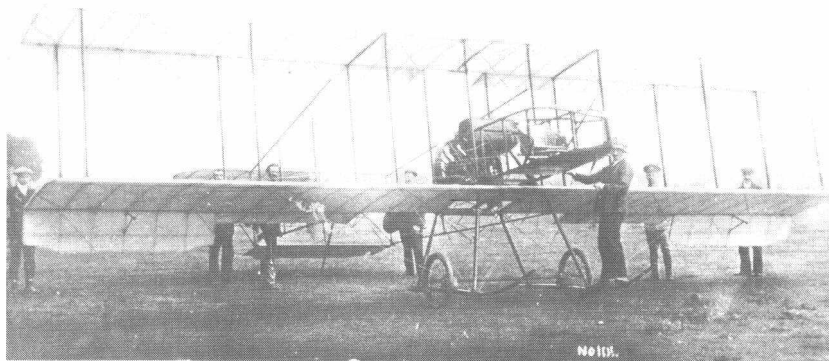
The F.E.2 in 1912.

Royal Aircraft Factory F.E.2

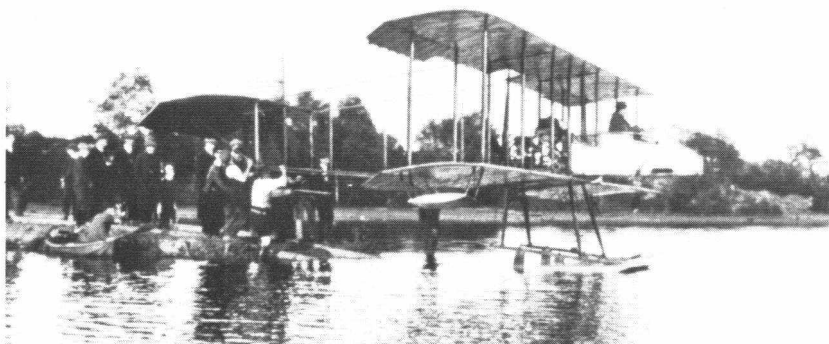
This was an improved aeroplane powered by a 50 h.p. Gnome, similar to the F.E.1 in its final form, but fitted with a sesquiplane tail unit and a wood and canvas nacelle with two seats. On its first outing at Farnborough on August 16, 1911 it taxied only 50 yards before a piston broke up and the pieces were ejected through an exhaust port but, at 6.30 a.m. on August 18, Geoffrey de Havilland successfully flew it the short distance to Laffan's Plain and made four landings. Tail heaviness made gliding difficult but with more than 50 lb. of lead in the nose it flew well although this was later reduced when a monoplane tail unit was fitted.

On December 6, 1911 de Havilland flew the F.E.2 to Shrewton, near Larkhill, and after lunch returned to Farnborough having covered 100 miles in $2\frac{1}{4}$ hours flying time and, following a 'height test' to 1,900 ft. before the official observer, Capt. Burke, on December 23, qualified for the Royal Aero Club's Special Aviator's Certificate.

The aircraft was persistently right wing low but, after repeated rigging adjustments, was taken over to Fleet Pond where the wheels were removed, the skids were bolted to a single, shallow-draught float, and tail and wing tip floats fitted. First flights from the water, totalling $\frac{3}{4}$ hr., were made by de Havilland on April 12, 1912 but, with the drag of the float, 50 h.p. was not enough and the F.E.2 went back to Farnborough where the original engine was replaced by a 70 h.p. Gnome. It first flew with this engine on April 26 and was flown to the Pond next day for the float to be refitted. With extra power, water take-offs with pilot and passenger were quite good and the aircraft then went on to enjoy a comparatively long career on both wheel and float undercarriages.



The F.E.2 in its original condition with biplane tail and unbalanced ailerons.
(J.M.B./G.S.L. Collection.)



The F.E.2 on its central float undercarriage at Fleet Pond, Farnborough, in 1912.
(J.M.B./G.S.L. Collection.)

It was employed later in 1912 for trials with a Maxim machine gun mounted in the nose and in 1913 was extensively reworked with 70 h.p. Renault Vee 8 engine, streamlined nacelle, new outer wing panels which increased the span to 42 ft., tailplane raised to the top longerons, and a smaller rudder. In this form it resembled the larger and later F.E. types which were built in quantity.

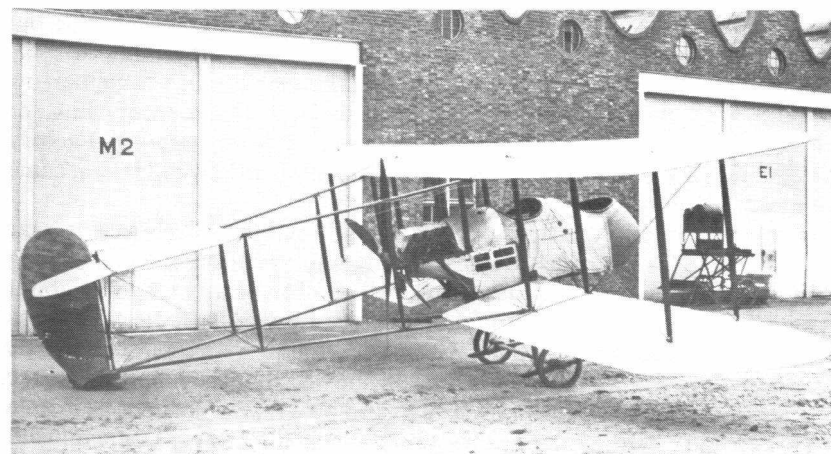
During a trip to the South Coast piloted by Royal Aircraft Factory test pilot Ronald Kemp on February 23, 1914, it spiralled into the ground from 500 ft. at West Wittering, seven miles from Chichester, Sussex, due it was said, to the absence of fixed fin area to offset the increased keel surface of the new nacelle. Passenger E. T. Haynes, a civilian scientist at the Factory, was killed and the aircraft destroyed.

SPECIFICATION AND DATA

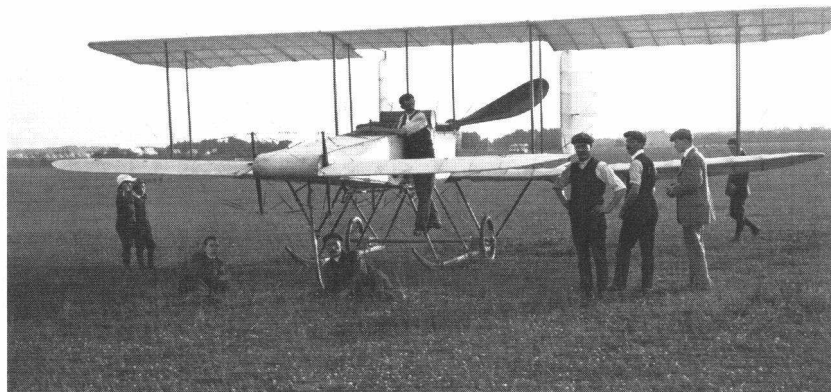
Construction: By the Royal Aircraft Factory, Farnborough, Hants.
Power Plants: One 50 h.p. Gnome
 One 70 h.p. Gnome
 One 70 h.p. Renault
Dimensions: Span 33 ft. 0 in. (increased to 42 ft. 0 in. in 1913)
 Length 28 ft. 0 in. Wing area 340 sq. ft.
Weights: All-up weight 1,200 lb.
Performance: Maximum speed 47.5 m.p.h.



The F.E.2 in 1912 with 70 h.p. Gnome and Maxim machine gun.



The F.E.2 in 1913 after major modifications and the installation of the 70 h.p. Renault engine. (J.M.B./G.S.L. Collection.)



The S.E.1 canard biplane. The 60 h.p. E.N.V. engine was mounted amidships and drove the pusher propeller through an extension shaft.

Royal Aircraft Factory S.E.1

The first type designed under Geoffrey de Havilland's direction after his appointment to Farnborough was a canard pusher biplane which, at a time when little money was being spent on new aeroplanes, had to be described as the rebuild of a crashed Army Blériot monoplane. In fact, nothing but the Blériot's 60 h.p. E.N.V. engine was used in its construction.

Two bay biplane wings were mounted at the rear end of a long, narrow nacelle, with twin rudders on outriggers behind and a front wing, or elevator, in the extreme nose. It received Royal Aircraft Factory designation S.E.1, signifying Santos Experimental initially but later it came to mean Scouting Experimental.

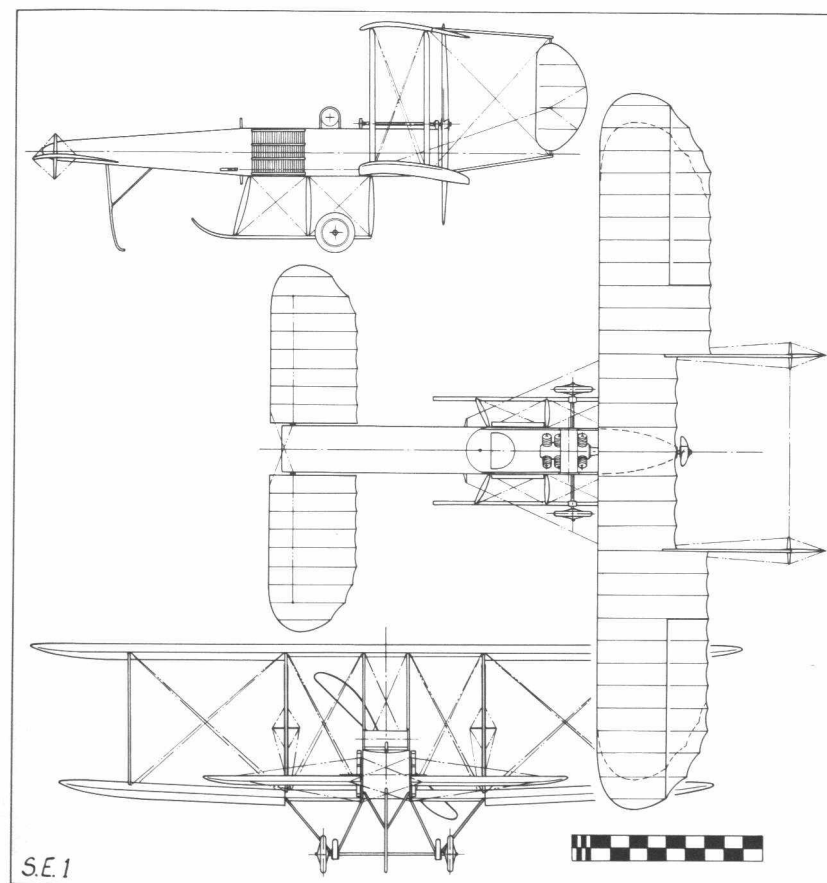
Roll-out took place at 5 a.m. on June 7, 1911 but the wheels were too far aft of the CG, causing the front skids to dig into the ground when taxiing and it was next day, after adjustments, before a first straight flight of about a mile was possible. Longer straight flights followed on June 10 when it was said to be fast and to climb well but it was not exactly a successful aeroplane and a flight to Laffan's Plain on June 28 showed that the hinge line of the front wing was too far ahead of the c.p. and progressive reductions in area were necessary before the S.E.1 became stable in pitch. Turns were difficult and although side area was reduced by stripping fabric from the sides of the nacelle, real improvement was only achieved when the all-moving front

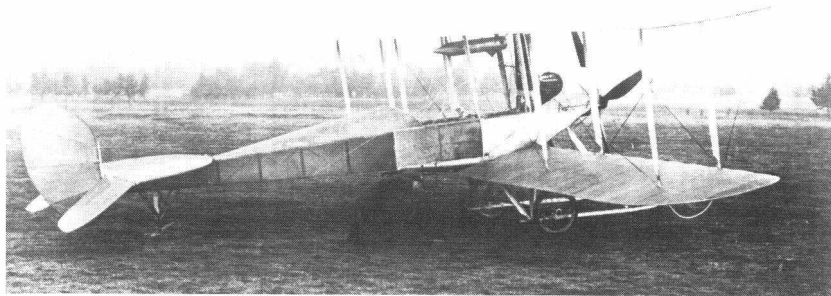
wing was replaced by a fixed aerofoil with trailing edge elevator.

Geoffrey de Havilland, its only pilot up to that time, flew it for the last time on August 16, 1911 when he made two return trips to Laffan's Plain with a misfiring engine. This was put right but two days later, on August 18, Lt. T. J. Ridge, Assistant Superintendent of the Royal Aircraft Factory but a pilot of only limited experience, stalled it off a gliding turn over Farnborough, spun it and was killed.

SPECIFICATION AND DATA

<i>Construction:</i>	By the Royal Aircraft Factory, Farnborough, Hants.		
<i>Power Plant:</i>	One 60 h.p. E.N.V. Type F.		
<i>Dimensions:</i>	Span 38 ft. 6 in.	Length 29 ft. 0 in.	
	Height 11 ft. 6 in.	Wing area 400 sq. ft.	
<i>Weights:</i>	All-up weight 1,200 lb.		



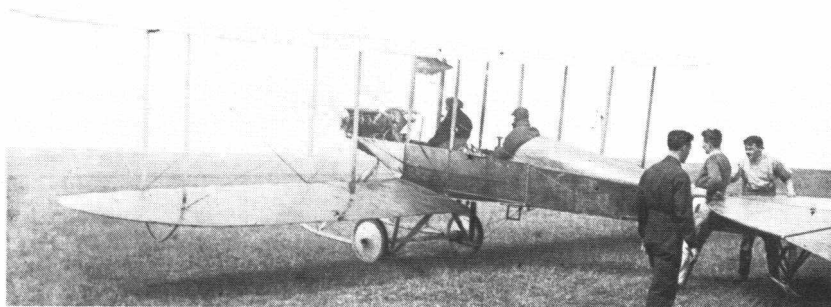


The B.E.1 in its original configuration with 60 h.p. Wolseley and radiator between the centre section struts. ('Flight' Photo 17751.)

Royal Aircraft Factory B.E.1

Like the S.E.1 before it, the construction of Geoffrey de Havilland and F. M. Green's next design, the two seat tractor B.E.1 biplane, was disguised as repairs to an existing aeroplane. In this case it masqueraded as a Voisin biplane which had been presented to the War Office by the Duke of Westminster but only its 60 h.p. Wolseley water-cooled engine lived on in the new aircraft.

The B.E.1 was orthodox to modern eyes with slightly greater span to the upper wing but there was no fixed fin and lateral control was by wing warping. It was pushed out for first engine runs at Farnborough on December 4, 1911 and first flew in the experienced hands of de Havilland on December 27. The first passenger was F. T. Hearle on January 3, 1912 but the rest of the month was spent in solving rigging problems. It eventually flew well, once at night, and carried a large number of passengers but before long the cumbersome Wolseley engine installation, with its drag-producing radiator between the front centre section struts, was scrapped in favour of



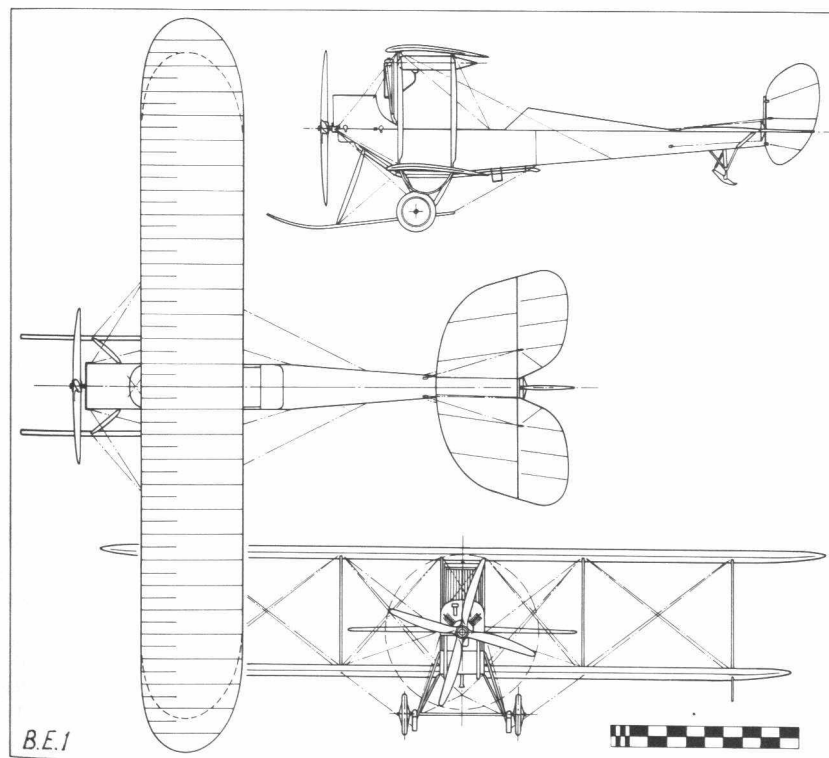
The B.E.1 with uncowed 60 h.p. Renault engine. (Imperial War Museum Photo Q.66473.)

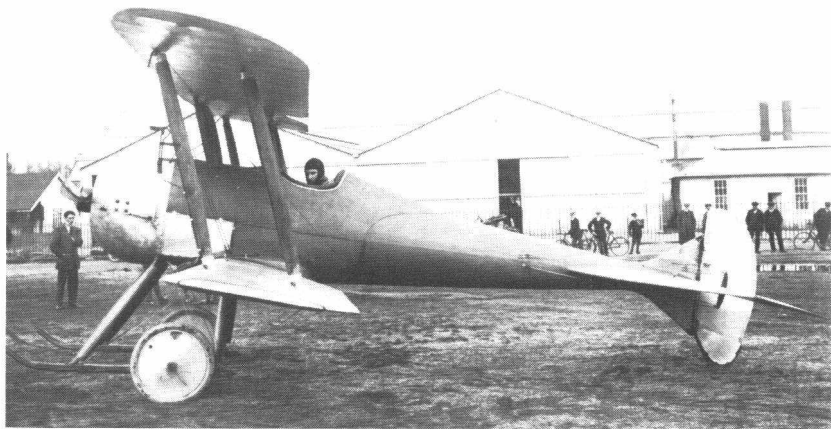
an air-cooled 60 h.p. Renault. This engine was at first completely uncowed but the nose was later faired in to give protection to the occupants and the aircraft was so much quieter in the air than rotary engined machines that it was known locally as 'the silent aeroplane'.

The B.E.1, progenitor of the mass produced B.E.2s of several marks used during the First World War, had a comparatively long career and was equipped with early radio apparatus by Capt. H. P. T. Lefroy, R.E. With Geoffrey de Havilland as pilot he then used it for pioneer wireless controlled artillery shoots on Salisbury Plain. On March 11, 1912 it was handed over to Capt. J. C. Burke, C.O. of the Air Battalion, accepted as airworthy next day, and later taken on charge by No. 2 Squadron, R.F.C. with serial number 201. In the hands of Capt. Burke and other pilots it took part in a number of experimental flights at Farnborough during 1913 and 1914 and eventually crashed there in January 1915.

SPECIFICATION AND DATA

<i>Construction:</i>	By the Royal Aircraft Factory, Farnborough, Hants.		
<i>Power Plants:</i>	One 60 h.p. Wolseley		
	One 60 h.p. Renault		
<i>Dimensions:</i>	Span 38 ft. 7½ in.	Length 29 ft. 6½ in.	
<i>Performance:</i>	Maximum speed 59 m.p.h.	Climb to 600 ft. 3 min. 52 sec.	





Geoffrey de Havilland seated in the B.S.1 after the first rudder modification and redesignation to B.S.2. (Imperial War Museum Q.66009.)

Royal Aircraft Factory B.S.1

The last aircraft designed by Geoffrey de Havilland and his team before he left to join the Aircraft Manufacturing Co. Ltd. was the B.S.1 single seat biplane flown early in 1913. Powered by a 14 cylinder, two row Gnome rotary, it was the first aeroplane in the world specifically designed as a fast single seat scout and as Blériot was said to have originated the tractor biplane, was known as the Blériot Scout, or B.S.1.

Its wooden, circular section monocoque fuselage, a masterpiece of the cabinet maker's art and years ahead of its time, merged smoothly into the lines of the closely cowled engine to give the B.S.1 a very good streamlined shape. Lateral control was by warping the single bay wings and the tail unit featured a diminutive rudder, without fixed fin, mounted above a one-piece tailplane and elevator.

For its day the B.S.1 was very fast and in March 1913 its designer, now Lt. de Havilland, Special Reserve, was timed over the speed course at 91.4 m.p.h. Unfortunately the rudder was far too small for the considerable keel surface of the deep front fuselage and directional control was poor. Consequently, later on the day of the speed trials, it went out of control in a turn and de Havilland was injured as it struck the ground in a flat spin.

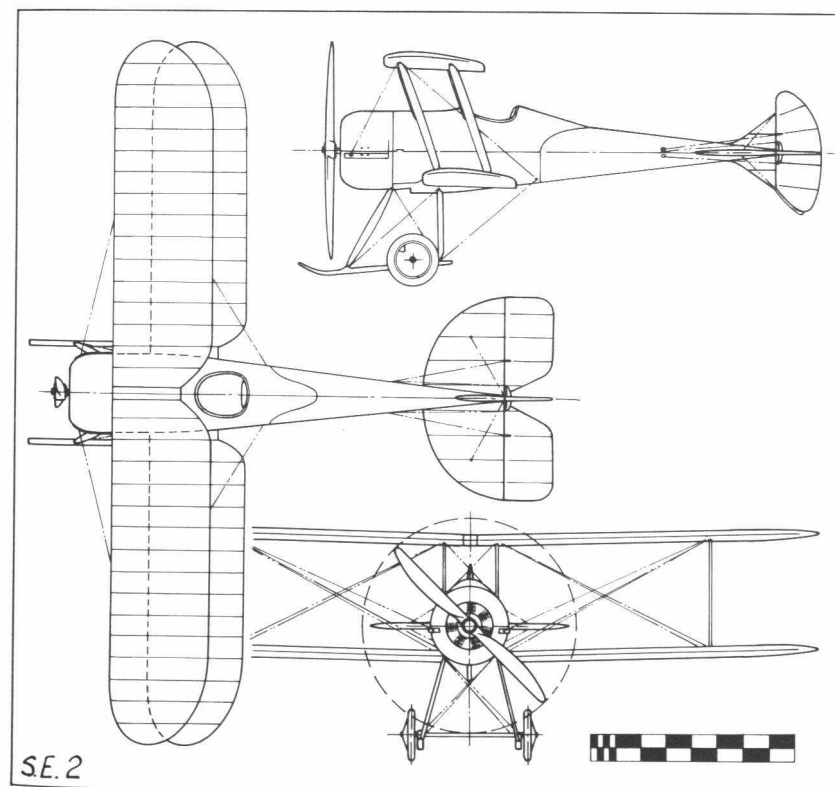
During extensive repairs the aircraft was re-engined with an 80 h.p. Gnome and fitted with a divided elevator to accommodate a tall, high aspect ratio rudder with small fixed fins above and below the fuselage. It was then redesignated B.S.2, later changed to S.E.2, but within a few

months the rudder was enlarged still more and the machine reappeared with a fabric covered strut-and-longeron rear fuselage.

It was taken over by No. 5 Squadron, R.F.C. in January 1914 and also served with No. 3 Squadron at Netheravon. It was sent to Moyenneville, France in October 1914 and flew offensive patrols until March 1915. Armament consisted of two rifles mounted on the sides of the fuselage to fire outside the arc of the propeller.

SPECIFICATION AND DATA

<i>Construction:</i>	By the Royal Aircraft Factory, Farnborough, Hants.		
<i>Power Plants:</i>	(B.S.1) One 100 h.p. Gnome		
	(B.S.2) One 80 h.p. Gnome		
<i>Dimensions:</i>	Span 27 ft. 6 in.	Length 22 ft. 0 in.	
<i>Weights:</i>	All-up weight 1,230 lb.		
<i>Performance:</i>	(B.S.1) Maximum speed 92 m.p.h.	Landing speed 51 m.p.h.	
	Initial climb 900 ft./min.	Endurance 3 hours	
	(B.S.2) Maximum speed 85 m.p.h.	Landing speed 47 m.p.h.	
	Initial climb 700 ft./min.		



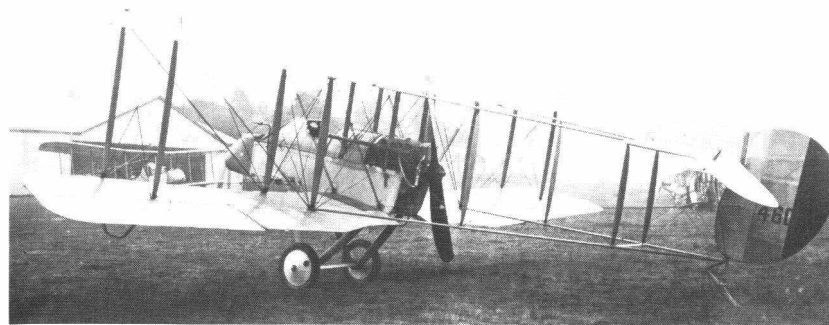


Capt. G. de Havilland in the prototype D.H.1 with auxiliary aerofoils, at Hendon in January 1915. (*'Flight' Photo 0192.*)

De Havilland D.H.1

Geoffrey de Havilland's first design after joining the Aircraft Manufacturing Co. Ltd. as Chief Designer in June 1914, was a two seat reconnaissance biplane armed with a forward firing machine gun. Following contemporary practice, it was a twin boom, two bay, wire braced biplane of fabric covered wooden construction and the mainplanes were of the normal two spar type, wire braced internally. A pusher layout was chosen to give the observer/gunner the maximum possible arc of fire from the front cockpit, and the design included three unusual features; coil springs in the undercarriage to absorb landing shocks, an elementary form of oleo leg to damp out the rebound, and the provision of air brakes. These were in the form of rotatable auxiliary aerofoils protruding some three feet on each side of the nacelle just behind the front centre section struts. The diversion of all available supplies of its intended engine, the 120 h.p. watercooled Beardmore, to F.E.2 and R.E.5 production resulted in the 70 h.p. aircooled Renault being fitted instead.

The prototype, designated Airco D.H.1, was completed and flown at Hendon in January 1915 and the designer showed his confidence in it by taking off without any preliminary straight hops and at once commencing to circle. He also piloted it during tests which not only showed it to be inherently stable and capable of being flown 'hands off' but also that the air brakes were ineffective. They were consequently removed. A small number of production D.H.1s were then built but these had the more normal type of rubber cord shock absorbers in the undercarriage, forward facing exhaust pipes and the front cockpit coaming lowered to the top longerons to improve the pilot's view and to permit free rotation of the single Lewis gun on its pillar mounting. Five of these aircraft reached Royal Flying Corps training units during 1915.



Production D.H.1, serial number 4607, with 70 h.p. Renault engine. (*Imperial War Museum Photo Q.57569.*)

Production on a larger scale was delayed until the 120 h.p. Beardmore was available in quantity but was finally undertaken by Savages Ltd. at King's Lynn in order to leave Airco free to develop newer types. With the Beardmore engine the machine carried the designation D.H.1A and was identified by the upright six cylinder engine, the large radiator behind the pilot's head and the gravity fuel tank mounted under the port upper wing root. The prototype D.H.1A, which bore the R.F.C. serial 4606, was converted from an Airco-built D.H.1. Although 73 D.H.1s and D.H.1As were delivered to the Royal Flying Corps, they saw little war service and in 1916 six were shipped to the Middle East Brigade for operational use by No. 14 Squadron. Home Defence squadrons received 24 and a further 43 went to training units such as No. 35 Reserve Squadron, Northolt and No. 199 Training Squadron. The type remained operational until early in 1917 after which it was relegated to second line duties until finally withdrawn from service at the end of 1918.



The prototype D.H.1A, serial number 4606, with 120 h.p. Beardmore engine.

SPECIFICATION AND DATA

Manufacturers: The Aircraft Manufacturing Co. Ltd., Hendon, London, N.W.9

Savages Ltd., King's Lynn, Norfolk

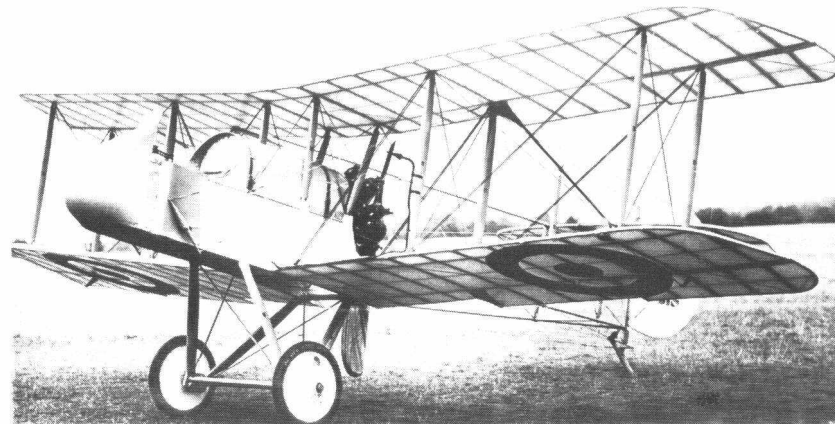
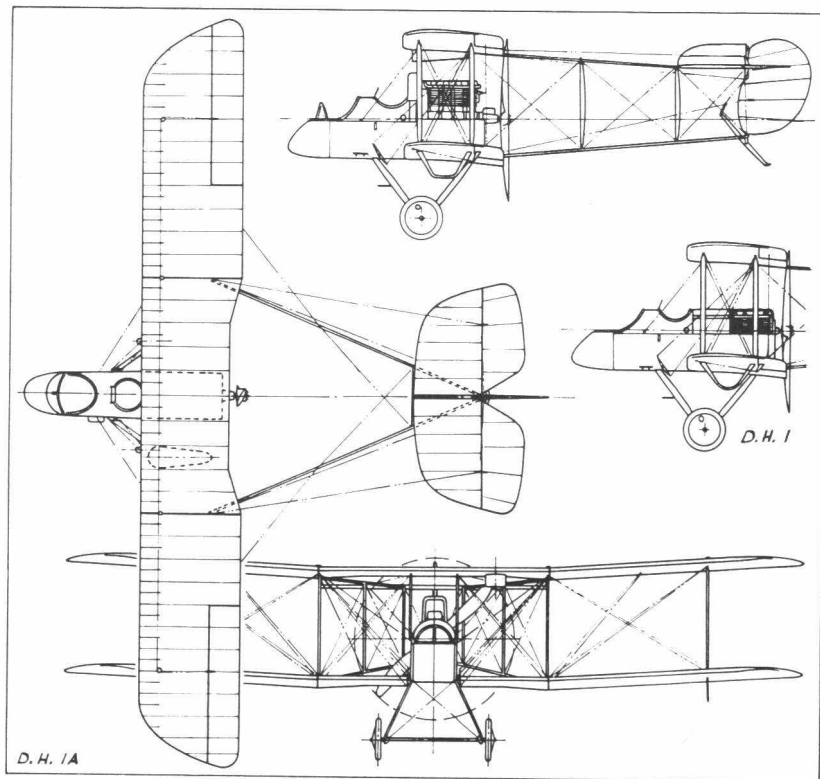
Power Plants: (D.H.1) One 70 h.p. Renault

(D.H.1A) One 120 h.p. Beardmore

Dimensions, Weights and Performances:

	D.H.1	D.H.1A
Span	41 ft. 0 in.	41 ft. 0 in.
Length	28 ft. 11 $\frac{3}{8}$ in.	28 ft. 11 $\frac{1}{4}$ in.
Height	11 ft. 4 in.	11 ft. 2 in.
Wing area	426 $\frac{1}{2}$ sq. ft.	426 $\frac{1}{2}$ sq. ft.
Tare weight	1,356 lb.	1,610 lb.
All-up weight	2,044 lb.	2,340 lb.
Maximum speed	80 m.p.h.	90 m.p.h.
Initial climb	350 ft./min.	600 ft./min.
Service ceiling	—	13,500 ft.

Production: Prototype and 100 production aircraft with R.F.C. serial ranges 4600–4649 and A1611–A1660.



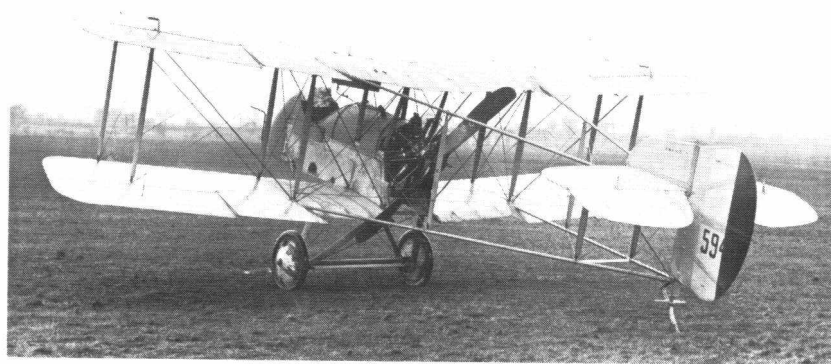
The prototype D.H.2 with 100 h.p. Gnome Monosoupape rotary.

De Havilland D.H.2

As First World War military authorities were slow to realise its importance, no British interruptor gear had been developed to permit the use of a machine gun firing forward through the airscrew of a tractor aeroplane. The D.H.2 single seat fighter was consequently a pusher and resembled a scaled down D.H.1, its main components being similar but smaller versions of those of the earlier type. It was an unstaggered two bay biplane of orthodox fabric covered wooden construction, powered by a 100 h.p. Gnome Monosoupape rotary aircooled engine, using tubular steel instead of wooden tail booms and employing a steerable tail skid. The prototype D.H.2, first flown by Geoffrey de Havilland on June 1, 1915, proved to be tail heavy but next day, with 30 lb. of ballast in the nose, he reached 3,500 ft. in 5 minutes—a truly remarkable rate of climb for those days. On June 3rd it went back into the works for the nacelle to be moved 4 inches forward and the gun and a larger rudder fitted, after which large scale production for the Royal Flying Corps was wholly undertaken in the Airco factory at Hendon and four hundred D.H.2s were ultimately delivered. These carried a single Lewis gun on a flexible mounting in front of the pilot, necessitating a slightly reshaped nacelle, and a few were fitted with the 110 h.p. Le Rhône rotary in place of the Gnome. R.F.C. pilots were quick to learn the technique of aiming the whole aeroplane at their targets and thereafter used the Lewis gun as a fixed weapon. Sensitivity of control, a limited speed range, and the inexperience of pilots, resulted in a number of early accidents through spinning, while others were caused by structural damage following the disintegration of the rotary engines in flight. In time however, its many lurid soubriquets gave way to an appreciation of its immensely strong structure

and delightful handling qualities, so that it became a fully aerobatic fighting machine of great merit. The first squadron to use the D.H.2 operationally was No. 24, commanded by Major Lanoe G. Hawker who led his twelve machines from Hounslow to St. Omer on February 7, 1916. Within three months No. 29 and No. 32 Squadrons had also been re-equipped and sent to France and their D.H.2s, together with those of No. 24 Squadron, took part in the Battle of the Somme and fought continuously against the Fokker monoplane and other enemy fighters until the early part of 1917. A total of 266 served with the British Expeditionary Force in France, where they formed part of the equipment of Nos. 5, 11, 16 and 18 Squadrons and contributed handsomely to the establishment of Allied air supremacy.

Among the many epic events in the fighting life of this historic aircraft, three were of outstanding importance, the first on July 1, 1916 when Major L. W. B. Rees, Commanding Officer of No. 32 Squadron, won the Victoria Cross for a single-handed attack on a formation of ten German two seaters which lost two of their number. Later that year, on October 28th, a D.H.2 of No. 24 Squadron was the unwitting cause of the death of the leading German fighter pilot Oswald Boelcke. While diving to attack the D.H.2, Boelcke's Albatros was struck by the undercarriage of another of his flight and dived into the ground when the mainplanes came off. A few weeks afterwards, on November 23rd, another well-known German pilot, Manfred von Richtofen, shot down Major Lanoe G. Hawker in his D.H.2 after one of the longest single combats of the war. In 774 combats, the D.H.2s of No. 24 Squadron destroyed 44 enemy aircraft.



Production D.H.2, serial number 5943. (De Havilland Photo.)

Two D.H.2s were issued to Home Defence squadrons and on June 17, 1917, a machine from the Orfordness Experimental Station, flown by Capt. R. H. M. S. Saundby, took part in an attack on the Zeppelin L.48. When ousted from the Western Front by the D.H.5 and other tractor fighters, thirty-two D.H.2s were despatched to the Near East where they saw service in Palestine with No. 17 and No. 111 Squadrons and in

Macedonia with No. 47 Squadron and the R.F.C./R.N.A.S. Composite Fighting Squadron. At home, one hundred D.H.2s were issued to training units including No. 10 Reserve Squadron at Joyce Green, but by the autumn of 1918 all D.H.2s had been struck from R.A.F. charge.

SPECIFICATION AND DATA

Manufacturers: The Aircraft Manufacturing Co. Ltd., Hendon, London, N.W.9.

Power Plants: One 100 h.p. Gnome Monosoupape

One 110 h.p. Le Rhône

Dimensions: Span 28 ft. 3 in.

Length 25 ft. 2½ in.

Height 9 ft. 6½ in.

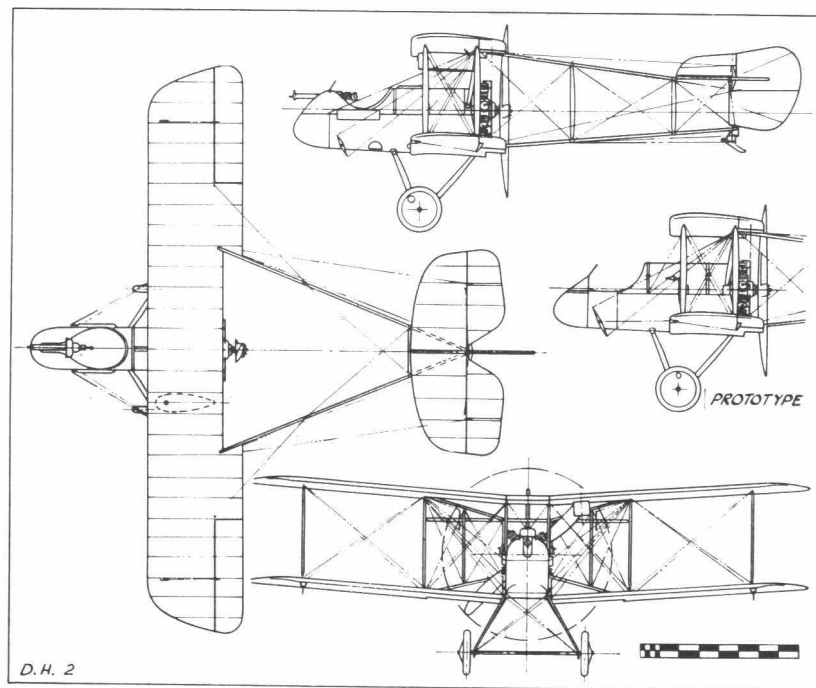
Wing area 249 sq. ft.

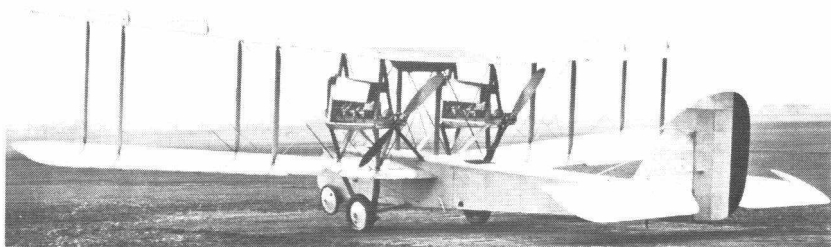
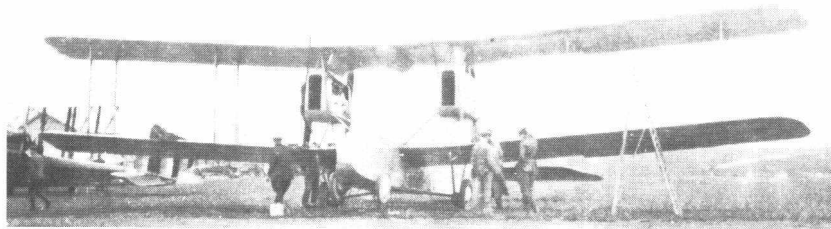
Weights and Performances:

	Gnome	Le Rhône
Tare weight	943 lb.	1,004 lb.
All-up weight	1,441 lb.*	1,547 lb.
Maximum speed	93 m.p.h.	92 m.p.h.
Climb to 6,500 ft. . . .	12 mins.	12 mins.
Service ceiling	14,000 ft.	—
Endurance	2¾ hours	3 hours

* Prototype 1,310 lb.

Production: R.F.C. serials 4732 (prototype), 5916 to 6015, 7842 to 7941, 8725, A2533 to A2632, A4764 to A4813, A4988 to A5087. Not all delivered.



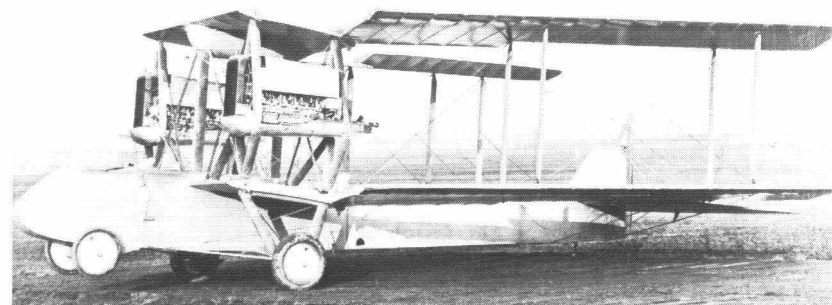


The D.H.3 prototype with 120 h.p. Beardmore engines.

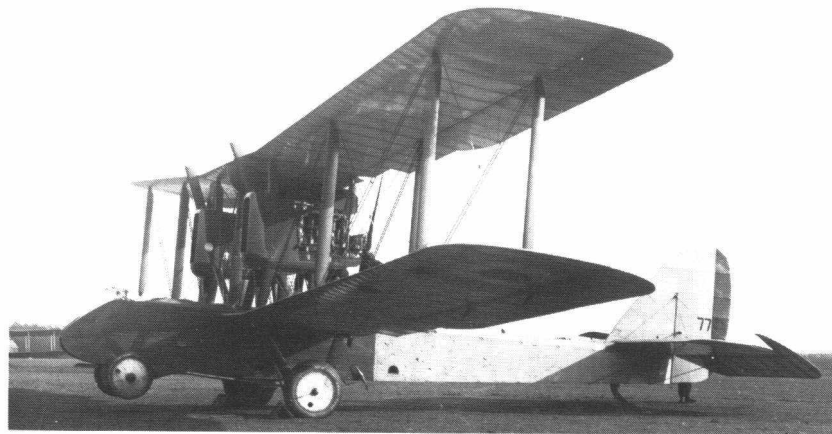
De Havilland D.H.3.

The D.H.3, Capt. Geoffrey de Havilland's third design for the Aircraft Manufacturing Co. Ltd., which appeared in 1916, was a large two bay biplane capable of bombing German industrial centres. Contrasting in every way with his previous small pusher fighters but owing something to the Royal Aircraft Factory's F.E.4, in the early design of which Capt. de Havilland had collaborated, the D.H.3 was equipped with two 120 h.p. Beardmore water-cooled engines in nacelles between the mainplanes. The long, slender, wire braced Warren girder fuselage was built of spruce, covered with plywood at the forward end and carried low to the ground on a wide track, short legged undercarriage. A pair of bumper wheels was provided under the nose. The four bladed, nine foot diameter pusher air-screws were carried clear of the mainplane trailing edges by short extension shafts and the D.H.3 was also the first aeroplane to feature the graceful curving rudder which was to become characteristic of almost every future de Havilland design. As might be expected on so large an aeroplane it was necessary to ensure good handling qualities by using an elevator with generous horn balances. The crew of three consisted of the pilot in an open cockpit just ahead of the mainplanes, and front and rear gunners whose cockpits were each equipped with two Lewis gun pillar mountings. For its day the D.H.3 had a very lively performance and when engaged on long range duties could carry a military load of 680 lb. and fuel for eight hours.

Only the prototype was built and this carried no serial number. A second version, carrying R.F.C. serial 7744, was powered by two 160 h.p. Beardmore engines and so modified as to warrant the designation D.H.3A. These modifications included the cutting back of mainplane trailing edges in order to obviate the use of engine extension shafts, while to lighten the controls still further, the rudder was given increased balance area. An order was placed for 50 production D.H.3As but when the first, *A5088*, was still under construction, the War Office shortsightedly cancelled the contract in the belief that strategic bombing of Germany was unnecessary and that the twin engined bomber was impracticable. Both prototypes were flown by pilots of the Upavon evaluation unit but were then relegated to the dump behind the Hendon hangars. It is said that the prototype D.H.3s were actually burning on the factory scrap heap on July 7, 1917 while London was being bombed by their German counterpart, the Gotha. This and later bombardments encouraged a rapid change of official



The wings of the D.H.3 were designed to fold outboard of the centre section in order to save hangar space.



D.H.3A, serial number 7744, showing the cut back mainplane trailing edge. (*Imperial War Museum Photo Q.67535.*)

attitude which resulted in the D.H.3 being redesigned and eventually built in quantity as the D.H.10.

SPECIFICATION AND DATA

Manufacturers: The Aircraft Manufacturing Co. Ltd., Hendon, London, N.W.9.

Power Plants: (D.H.3) Two 120 h.p. Beardmore
(D.H.3A) Two 160 h.p. Beardmore

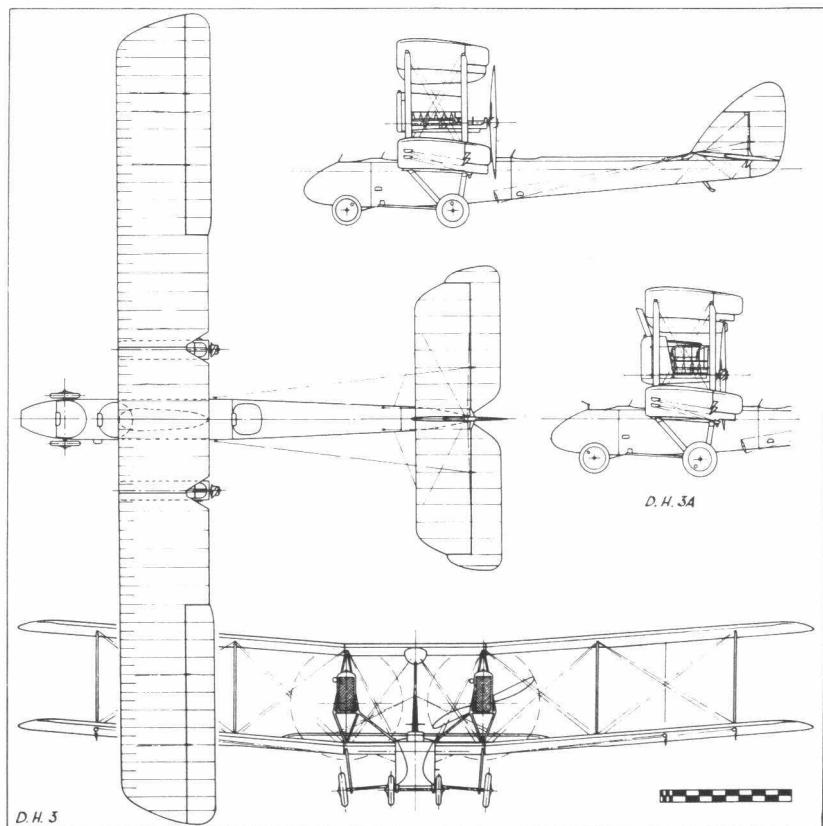
Dimensions: Span 60 ft. 10 in. Length 36 ft. 10 in.
Height 14 ft. 6 in. Wing area (D.H.3) 793 sq. ft. (D.H.3A) 770 sq. ft.

Weights: Tare weight (D.H.3) 3,980 lb.
All-up weight (D.H.3) 5,810 lb. (D.H.3A) 5,776 lb.

***Performance:** Maximum speed 95 m.p.h. Initial climb 550 ft./min.
Endurance 8 hours Range 700 miles

Production: Prototypes—D.H.3 unmarked, D.H.3A serial 7744
Others—7745 and A5088 unfinished
A5089 to A5137 cancelled

* D.H.3



The prototype D.H.4, serial number 3696, at Hendon in August 1916 showing the forward sloping rear centre section struts.

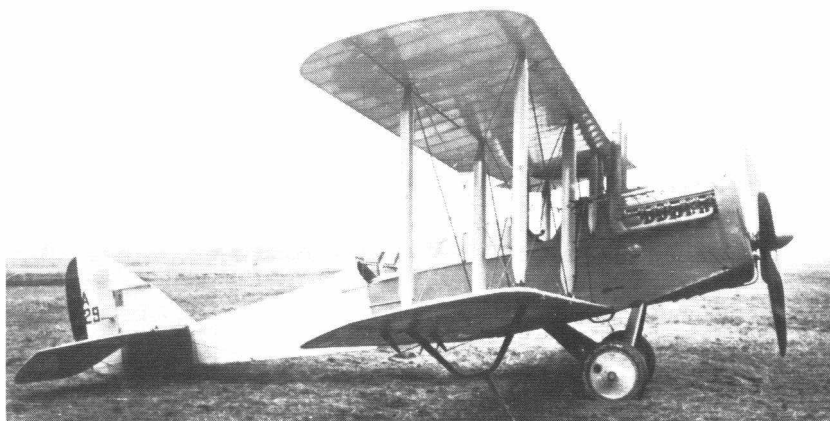
De Havilland D.H.4

The Airco D.H.4 day bomber, the prototype of which was numbered 3696 and first flew at Hendon in August 1916, was without question one of the outstanding aeroplanes of the First World War. Its fabric covered, wire braced, spruce and ash structure was typical of the day but the front fuselage, housing the cockpits and main fuel tanks, was strengthened with a plywood covering. Mainplanes and tailplane followed the usual two spar layout but the spars were lightened by spindling between the ribs and the tailplane was fitted with variable incidence gear. Rubber cord suspension was used in the undercarriage (two 6 ft. 9 in. lengths wound into nine turns for each wheel), and the fin and rudder conformed to the de Havilland family shape first used on the D.H.3. Standard armament consisted of one synchronised forward firing Vickers gun mounted on top of the fuselage, single or twin Lewis guns on a Scarff ring for the observer, and two 230 lb. and four 112 lb. bombs were carried in racks under the fuselage and wings respectively.

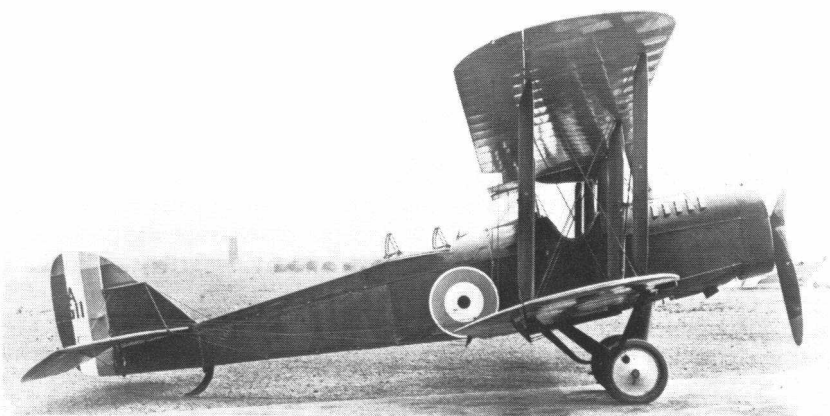
The prototype was fitted with a 230 h.p. B.H.P. six cylinder watercooled engine and was unique in having rear centre section struts which raked sharply forward. Production D.H.4s had the rear struts shortened and made parallel to the front and were powered by a variety of engines, including the 200 h.p. R.A.F. 3A, 230 h.p. Siddeley Puma, 250 h.p. Rolls-Royce III and 260 h.p. Fiat. Pilots were warned not to damage the airscrew by taking off with the tail too high, so that when more powerful engines such as the 375 h.p. Rolls-Royce Eagle VIII were developed and larger airscrews were needed, it was necessary to fit a taller undercarriage and this eventually became standard on all D.H.4s. The incidence was

also increased to shorten the landing run. All these engines were cooled by frontal radiators except the Fiat, first installed in A7532, the radiator for which was between the front undercarriage legs, permitting the use of close fitting engine cowlings in the manner of the later D.H.9. In addition to the modified undercarriage, late production D.H.4s also had the rear Scarff ring raised to improve the field of fire and the rear decking was made flat. Orders were placed with Airco and six sub-contractors for some 1,700 D. H.4s, of which 1,449 were actually delivered.

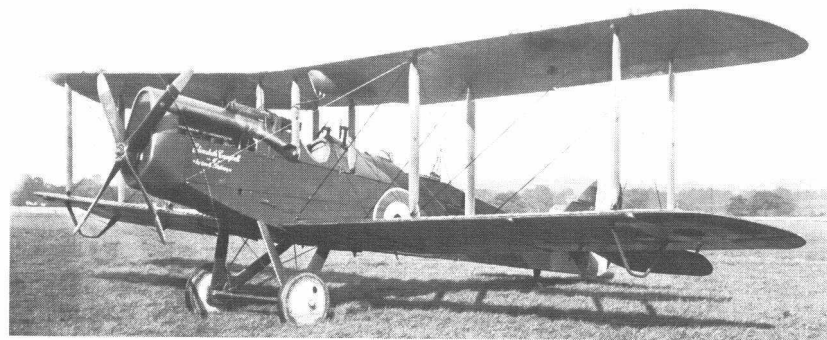
Pilots who flew the D.H.4 were unanimous in praise of its fine handling qualities, wide speed range and a performance which made it almost immune from interception. No previous aeroplane had had so wide a



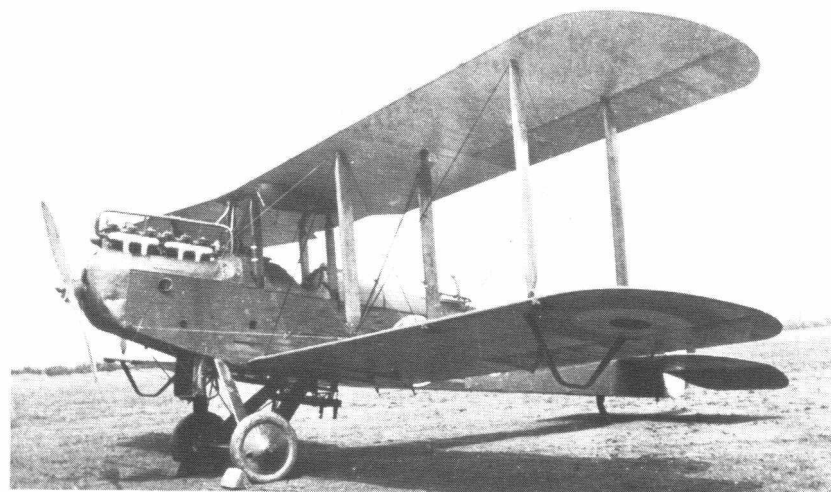
A2129 was an early production D.H.4 with short undercarriage, Scarff ring mounted on the top longerons, and 250 h.p. Rolls-Royce engine. (J.M.B./G.S.L. Collection.)



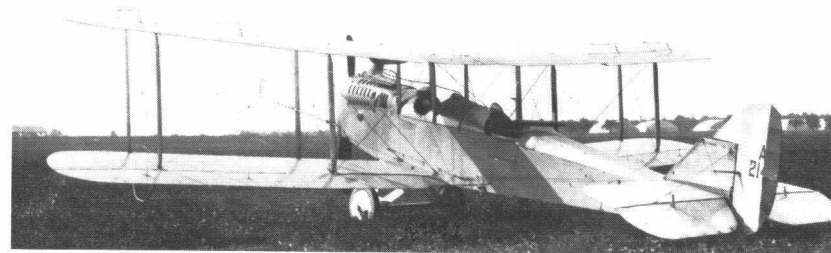
Airco-built D.H.4 A7511 with 200 h.p. R.A.F. 3A engine.



Production D.H.4 with 230 h.p. B.H.P. engine and tall undercarriage. (Imperial War Museum Photo H (AM)90.)



D.H.4 with 260 h.p. Fiat engine.



D.H.4 A2148 with experimental 300 h.p. Renault 12Fe engine. (Imperial War Museum Photo Q.66607.)

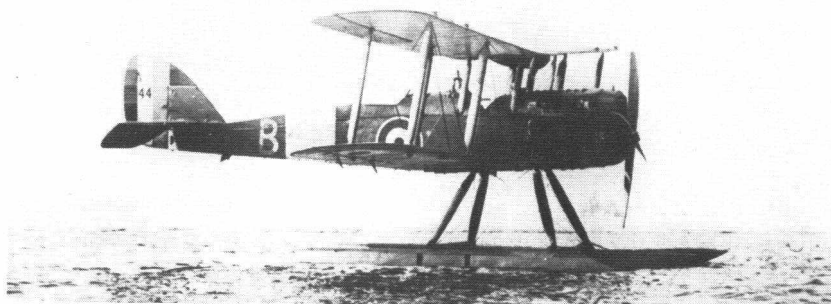
speed range (45–143 m.p.h. on the Eagle VIII version) and pilots' notes emphasised its slow speed docility, recommending that the approach be made at 60 and the touch down at 50 m.p.h. Operating at heights above 15,000 ft. the D.H.4 could outfly contemporary single seat fighters but if caught was usually an easy victim because the cockpits were so far apart that in the noise of battle Gosport tubes were useless as a means of co-ordinating defence and the aircraft went down in flames when bullets punctured the 60 gallon fuel tank between the seats. Late in 1917 fire hazards were much reduced when the pressurised fuel system was replaced by two wind driven pumps on top of the fuselage behind the pilot.

The first D.H.4s in France, delivered by air to No. 55 Squadron on March 6, 1917, were first used operationally at Valenciennes on April 6. As an R.A.F. Squadron at the end of the war, it bombed munitions factories at Frankfurt, Mannheim and Stuttgart but French and Belgian based D.H.4s were not entirely employed as day bombers but also made high level photographic reconnaissance flights, fighter sweeps and anti-Zeppelin and submarine patrols. The majority of naval D.H.4s were among 150 built under sub-contract by the Westland Aircraft Works. They were Eagle powered and fitted with twin, instead of single front guns and also a raised Scarff ring mounting for the rear gunner, but increases in weight and parasitic drag somewhat impaired their performance. The first D.H.4 to be built at Yeovil was flight tested by B. C. Hucks in April 1917 and delivered in France the next morning. Coastal patrols were also undertaken by R.N.A.S. Squadrons and at least one D.H.4 was experimentally fitted with twin floats for this task. No. 202 Squadron also took a complete set of oblique and vertical photographs of Zeebrugge in preparation for the historic raid of April 22–23, 1918 during which the Mole was bombed with great daring by Wg. Cdr. Fellowes flying a D.H.4. To No. 217 Squadron fell the honour of sinking the German submarine *U.B.12* on August 12, 1918. R.N.A.S., Great Yarmouth, was armed with D.H.4s, one of which was ditched in the North Sea on September 5, 1917 after an unsuccessful attack on the Zeppelin *L.44*, the crew being picked up by flying boat. On August 5, 1918 however, *A8032* piloted by Major Egbert Cadbury shot down *L.70* when 41 miles N.E. of base, from a height of over 16,000 ft. The Home Defence D.H.4s were operated far over the North Sea and efforts were made at the M.A.E.E., Isle of Grain, to equip them with flotation gear or as an alternative, hydrovanes and wing tip floats for use after the undercarriage was jettisoned. These devices were developed and test flown by Harry Busted using D.H.4s *A7457* and *D1769*. The latter was also used for trailing mine experiments and hydrovanes were also fitted to an American built DH-4 at McCook Field, Dayton, Ohio. Two D.H.4s, one of which was numbered *A2168*, were fitted with 1½ pounder Coventry Ordnance Works quick firing anti-Zeppelin guns. In 1917–18 the type was used overseas in small numbers as shown on page 67, while in the period 1919–21 many went as Imperial Gifts to assist the formation of air forces in Canada (12 aircraft) and South Africa (e.g. serials 26 and 401). Airco-built

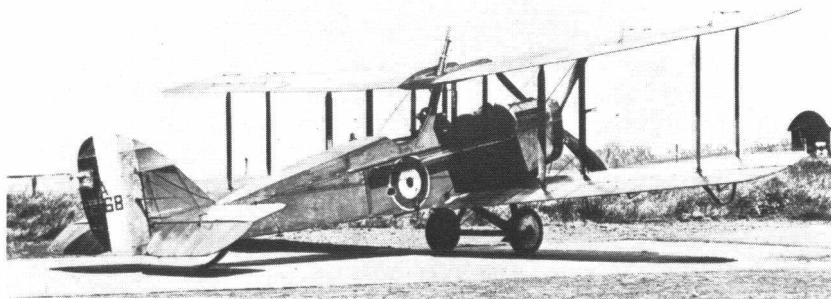
D.H.4s *A7893* and *A7929*, taken to New Zealand in 1919 by Col. A. V. Bettington, were stationed at Sockburn and *A7893*, piloted by Capt. T. Wilkes and L. M. Isitt was the first aircraft to fly over Mt. Cook.



A Westland-built D.H.4, N5978 of No. 5 Squadron, R.N.A.S., with built-up Scarff ring mounting. (J.M.B./G.S.L. Collection.)

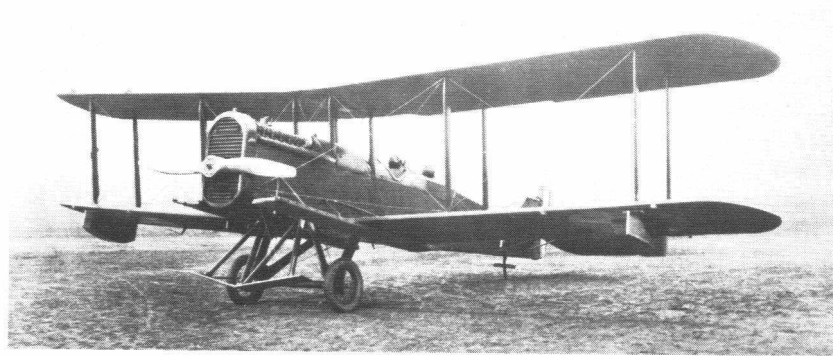


A coastal patrol D.H.4 with twin float undercarriage. (Imperial War Museum Photo Q.61685.)

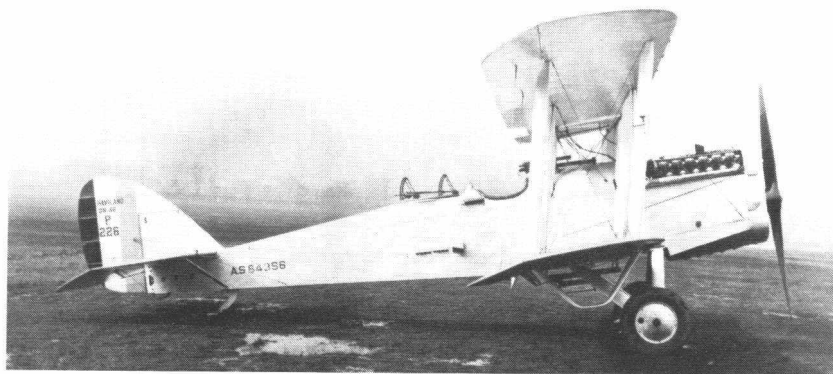


The 1½ pounder C.O.W. quick firing anti-Zeppelin gun mounted in D.H.4 *A2168*. Long exhaust pipes replaced the short stacks of the standard aircraft.

As an engine test bed the D.H.4 made a major contribution to Allied technical superiority and among the several experimental installations were those of the 300 h.p. Renault 12Fe in *A2148*, the 400 h.p. Sunbeam Matabele in *A8083*, the 353 h.p. Rolls-Royce G and the Ricardo-Halford inverted supercharged engine. One of the new American 400 h.p. Liberty 12 engines was fitted into a British built D.H.4 delivered at McCook Field in August 1917. It first flew with the Liberty on October 29th of that year and heralded the mass production of the D.H.4 in America. By the Armistice 3,227 had been constructed, 1,885 of which were shipped to France and by the end of 1918 the total of American built DH-4s had risen to 4,587, or more than three times the British production of 1,449. Eventually, the three American contractors delivered 4,846 examples of the DH-4 (see page 60), but after the war they were disposed of in considerable numbers to the Nicaraguan and other Latin American army air services.



American-built DH-4B with Grain flotation gear for test at McCook Field, Dayton, Ohio.



U.S. Army Air Corps DH-4B serial *A.S.64356* (McCook Field project number P226), showing the revised cockpit position and oversize wheels.

Financial depression virtually stopped the procurement of new American aircraft during the postwar years but maintenance funds permitted a considerable rebuilding programme. This gave rise to over 60 DH-4 variants, many of which remained on the active list for nearly a decade. The majority of such variants received an American-style hyphenated model number, commencing with DH-4A, applied to the single Dayton-Wright DH-4 which was fitted in July 1918 with an improved fuel system by the Engineering Division of the Army's Department of Aircraft Production. This aircraft should not be confused with the British cabin conversion designated D.H.4A. In October 1918, more extensive modifications by the Engineering Division produced the DH-4B in which the pilot's cockpit was moved back next to that of the gunner. One DH-4B, piloted by Lt. Maynard, won the New York-Toronto Aerial Derby on August 25, 1919 in a flying time of 7 hours 45 minutes. The total of such conversions made in 1918-24 reached 1,540 when the two final rebuilds were made by the de Havilland Aircraft Co. Ltd. to the order of Maj. Davidson for the use of Naval and Military Attachés of the U.S. Embassy in London. These aircraft, c/n 138 and 139, were test flown by Hubert Broad in August 1926 and based at Kenley and Stag Lane respectively in full U.S. military markings until replaced by a D.H.60 Moth in 1927.

American conversions fell into two main categories—specialised versions for military purposes, the surviving designations for which are listed in an accompanying table, and experimental conversions of the early DH-4B, mainly as engine testbeds or trial installations aircraft. Military models included the DH-4B-2 trainer, sometimes known as the Blue Bird, the DH-4B-5 two passenger Honeymoon cabin transport devised by the Engineering Division of the Bureau of Aeronautics, and ambulance versions for one or two stretchers. Two of the last named, U.S. Marine serials *A5811* and *A5883*, were used in 1922 in the island of Haiti, starting point of the longest flight in U.S. history up to that time, made in 1924 by two U.S. Army DH-4Bs which successfully covered the 10,953 miles to San Francisco and back.

DH-4 variants remained in military service with the U.S. Army, Navy and Marines until 1929, one DH-4B-3 being re-engined with a Packard 2A-1500 by the U.S. Navy at Quantico in 1926, but the last of the major variants had already appeared in 1924. They were built for the Corps Observation role, three by the Boeing company and one by Atlantic. The Boeings were ungainly sesquiplanes using steel DH-4M-1 fuselages and thick section wings of new design. The first, designated XCO-7, became the XCO-7A when fitted with a wide track undercarriage but crashed and was replaced by the XCO-7B, a similar machine powered by a 420 h.p. Liberty V-1410 experimental inverted engine. These prototypes scarcely resembled the DH-4B at all but the origins of the remaining Corps Observation conversion, XCO-8, could hardly be mistaken, being a reproduction of an undesignated conversion made in 1922 by the Gallaudet Aircraft Corporation which fitted a standard Liberty powered

DH-4B with the mainplanes and N type interplane struts from a Loening COA-1 amphibian. The true XCO-8 was an exactly similar conversion made two years later by the Atlantic company.

Steel tube fuselages were built by the Boeing and Atlantic companies in 1920-25 to extend the useful lives of these veterans under the designations DH-4M, DH-4M-1 and DH-4M-2, 186 of which were by Boeing and at least 135 by Atlantic. Considerable interest was aroused when two re-worked and specially modified DH-4s took off from Rockwell Field, San Diego, California on June 27, 1923 to conduct one of the first flight refuelling experiments. Lts. Lowell Smith and Paul Richter remained airborne for 6½ hours, during which time they were refuelled twice by hose from the DH-4 flown by Lts. Hine and Seifert. After minor adjustments they kept aloft for 37¼ hours on August 27-28th and landed only when fog prevented further contact with the tanker. On December 13, 1923 a DH-4 with supercharged Liberty, piloted by Lt H. Harris and carrying a passenger, climbed to an altitude of 27,000 ft. over McCook Field, increased later to 30,500 ft., reached in 69 minutes in a special DH-4B, *N.A.C.A.* 8, fitted with a Roots type supercharger behind the engine. In 1927 a DH-4M-2, *N.A.C.A.* 25, with Model II Roots blower, reached 26,500 ft. in 51 minutes using camera recorded automatic observer equipment in an enclosed rear cockpit.

SPECIFICATION AND DATA

Manufacturers: The Aircraft Manufacturing Co. Ltd., Hendon, London, N.W.9
F. W. Berwick and Co. Ltd., Park Royal, London, N.W.10
Glendower Aircraft Co. Ltd., 54 Sussex Place, South Kensington, London, S.W.7
Palladium Autocars Ltd., Felsham Road, Putney, London, S.W.15
The Vulcan Motor and Engineering Co. (1906) Ltd., Southport, Lancs.
Waring and Gillow Ltd., Cambridge Road, Hammersmith, London, W.6
Westland Aircraft Works, Yeovil, Somerset
SABCA, Haren Airport, Brussels, Belgium (15 built in 1926 for Belgian Air Force)
Atlantic Aircraft Corporation, Teterboro, New Jersey, U.S.A.
Boeing Airplane Company, Seattle, Washington, U.S.A.
The Dayton-Wright Airplane Co., Dayton, Ohio, U.S.A. (3,106 built)
The Fisher Body Corporation, U.S.A. (1,600 built)
Standard Aircraft Corporation, Elizabeth, New Jersey, U.S.A. (140 built)

Power Plants: One 200 h.p. R.A.F. 3A
One 230 h.p. B.H.P.
One 230 h.p. Siddeley Puma
One 250 h.p. Rolls-Royce Mk. III or Mk. IV
One 260 h.p. Fiat
One 275 h.p. Rolls-Royce Eagle VI
*One 300 h.p. Renault 12Fe
*One 300 h.p. Wright H
*One 300 h.p. Packard 1A-1116 or 1A-1237
*One 320 h.p. Armstrong Siddeley Jaguar I
One 325 h.p. Rolls-Royce Eagle VII
*One 353 h.p. Rolls-Royce G

One 375 h.p. Rolls-Royce Eagle VIII
*One Ricardo-Halford supercharged engine
One 400 h.p. Liberty 12
*One 400 h.p. Sunbeam Matabele
*One 420 h.p. Liberty V-1410
One 435 h.p. Liberty 12A
*One 435 h.p. Curtiss D-12
*One 525 h.p. Packard 2A-1500

* Experimental installation

British Production:

Serial range	Manufacturer	Serial range	Manufacturer
A2125 to A2174	Airco	D8351 to D8430	Airco
A7401 to A8089	Airco	D9231 to D9280	Airco
B1482	Airco	F1551 to F1552	Airco
B2051 to B2150	Berwick	F2633 to F2732	Glendower
*B3954 to B3970	Westland	F5699 to F5798	Palladium
B5451 to B5550	Vulcan	F7595 to F7598	Airco
B9476 to B9500	Westland	H5290	Glendower
C4501 to C4540	Airco	H5894 to H5939	Waring and Gillow
D1751 to D1775	Westland	**N5960 to N6009	Westland
		**N6380 to N6429	Westland

Rebuilt from salvaged components: B7747, B7812, B7910, B7933, B7941, B7950, B7969, B7987, B7991, B9994, F5809, F5827, F5828, F5833, F5837, F5846, F6001, F6096, F6104, F6114, F6115, F6139, F6167, F6168, F6187, F6222, F6234, F6253, H7118, H7123, H7147, H7148

* Renumbered from N series.

** Not all delivered.

Two DH-4B conversions made at Stag Lane in 1924 were allotted de Havilland constructor's numbers 138 and 139.

Boeing Production:

Boeing model	Constructor's numbers	Quantity	Type	Built for
Model 16	88-198	111	DH-4B	U.S. Army
	412-461	50	DH-4B	
	462-511	50	DH-4M	
	515-517	3	DH-4M	
	519-615	97	DH-4M-1	
Model 42	616	1	XCO-7	U.S. Marines
	617	1	XCO-7A	
	618	1	XCO-7B	
Model 16	619-648	30	DH-4M-1	Cuban Government
	653-658	6	DH-4M	

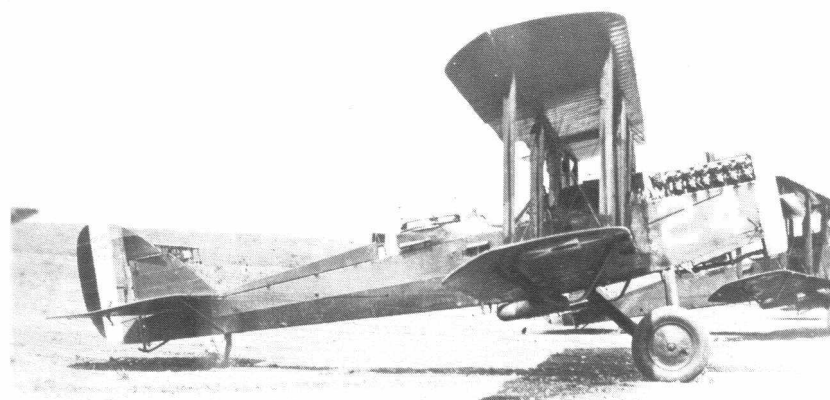
American Serial Numbers: United States Army serials were not adequately recorded and cannot be given. United States Navy Bureau A Registry serials 3245 to 3324, 3384 to 3458, 5809 to 5829, 5834 to 5839, 5870 to 5884, 5982 to 6004, 6113 to 6192, 6326 to 6401, 6514.



Closely resembling the British civil D.H.4A, the DH-4B-5 serial *A.S.23-1200* (project number P288), was one of a number of Engineering Division airway conversions.



DH-4C with 300 h.p. Packard 1A-1116 engine.



The metal fuselaged DH-4 was identified by prominent fuselage stringers. This example, a Boeing-built DH-4M-1, carried U.S. Army Air Corps serial *A.S.31202*.

Dimensions, Weights and Performances:

(a) British

	B.H.P.	Puma	Rolls III	Eagle VIII	R.A.F. 3A	Fiat	Liberty 12
Span . . .	42 ft. 4½ in.	42 ft. 4½ in.	42 ft. 4½ in.	42 ft. 4½ in.	42 ft. 4½ in.	42 ft. 4½ in.	42 ft. 6 in.
Length . . .	30 ft. 8 in.	30 ft. 8 in.	30 ft. 8 in.	30 ft. 8 in.	29 ft. 8 in.	29 ft. 8 in.	30 ft. 6 in.
Height . . .	10 ft. 1 in.	10 ft. 1 in.	10 ft. 5 in.	11 ft. 0 in.	10 ft. 5 in.	10 ft. 5 in.	10 ft. 3½ in.
Wing area . . .	434 sq. ft.	434 sq. ft.	434 sq. ft.	434 sq. ft.	434 sq. ft.	434 sq. ft.	440 sq. ft.
Tare weight . . .	2,197 lb.	2,230 lb.	2,303 lb.	2,387 lb.	2,304 lb.	2,306 lb.	2,391 lb.
All-up weight . . .	3,386 lb.	3,344 lb.	3,313 lb.	3,472 lb.	3,340 lb.	3,360 lb.	4,297 lb.
Maximum speed . . .	108 m.p.h.	106 m.p.h.	119 m.p.h.	143 m.p.h.	122 m.p.h.	114 m.p.h.	124 m.p.h.
Initial climb . . .	700 ft./min.	1,000 ft./min.	925 ft./min.	1,350 ft./min.	800 ft./min.	1,000 ft./min.	—
Ceiling . . .	17,500 ft.	17,400 ft.	16,000 ft.	22,000 ft.	18,500 ft.	17,000 ft.	17,500 ft.
Endurance . . .	4½ hours	4½ hours	3½ hours	3½ hours	4 hours	4½ hours	3 hours

(b) American

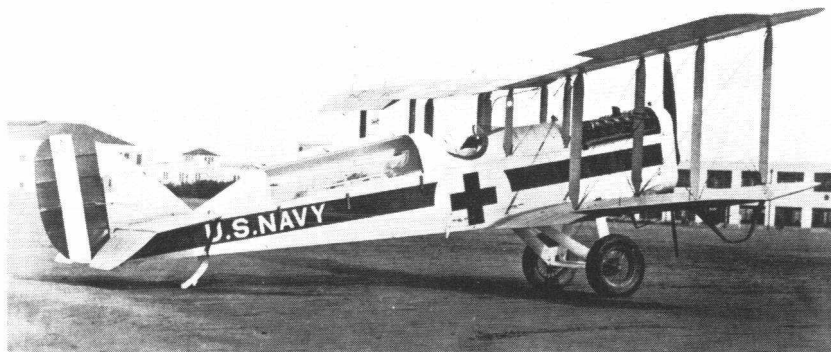
	DH-4B	DH-4M-1	DH-4M-2	XCO-7	XCO-7A	XCO-7B	XCO-8
Engine . . .	Liberty 12A	Liberty 12A	Liberty 12A	Liberty 12A	Liberty 12A	Liberty V-1410	Liberty 12A
Span . . .	42 ft. 5½ in.	42 ft. 5½ in.	42 ft. 5½ in.	45 ft. 0 in.	45 ft. 0 in.	45 ft. 0 in.	45 ft. 0 in.
Length . . .	29 ft. 11 in.	29 ft. 11 in.	29 ft. 11 in.	30 ft. 4 in.	30 ft. 4 in.	30 ft. 11 in.	30 ft. 0 in.
All-up weight . . .	4,600 lb.	4,595 lb.	4,595 lb.	4,798 lb.	4,800 lb.	4,652 lb.	4,680 lb.
Maximum speed . . .	124 m.p.h.	118 m.p.h.	118 m.p.h.	130 m.p.h.	—	122 m.p.h.	130 m.p.h.



DH-4BW serial *A.S.63897* (project number P133) with 300 h.p. Wright H engine, Hispano licence.



The DH-4B Fiat engine testbed showing the large oval radiator.



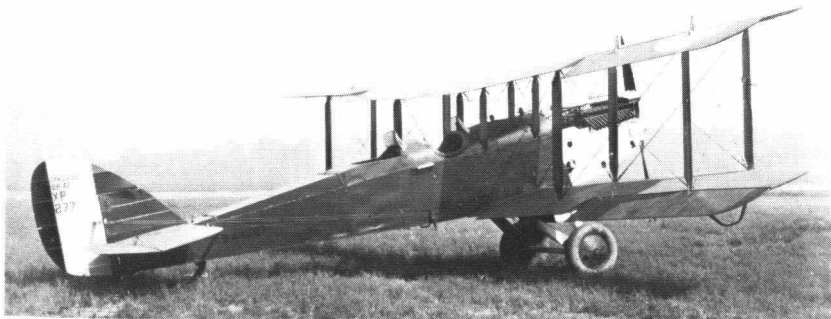
U.S. Navy DH-4Amb-1 ambulance conversion *A6125*.



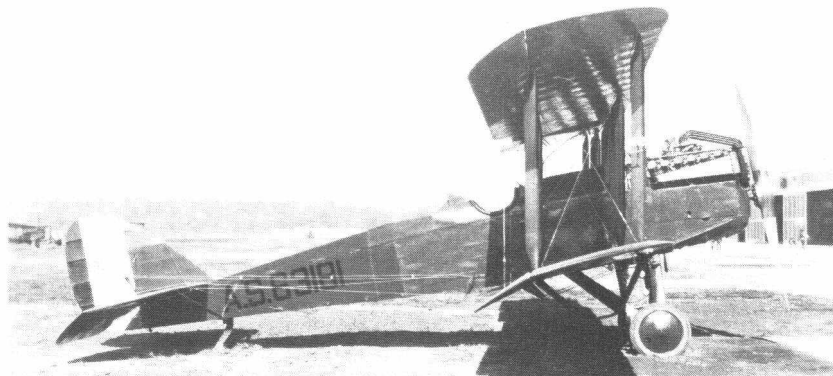
The high altitude DH-4B serial *A.S.63630* (project number P139), with lengthened undercarriage and geared, supercharged Liberty engine driving a four bladed, large diameter airscrew.



DH-4B fitted with the complete wing cellule from a Loening COA-1 amphibian by the Gallaudet Aircraft Corporation in 1922. U.S. Army serial *A.S.23-669* (project number P329).



The DH-4B Curtiss D-12 engine testbed, serial *A.S.64587* (project number XP277).



DH-4B serial A.S.63181 (project number P190) with turbo-supercharged Liberty. The radiator and intercooler were fitted between the undercarriage struts.



DH-4B testbed A.S.63737 (project number P188) with British-built Armstrong Siddeley Jaguar I radial.



The DH-4B testbed for the 420 h.p. Liberty V-1410 inverted engine later fitted to the XCO-7B.

DH-4A	Modified fuel system, 110 gallon main tank
DH-4B	Pilot next to gunner, 88 gallon main tank, oversize wheels
DH-4B-1	As DH-4B but with 110 gallon main tank
DH-4B-2	Trainer version of DH-4B-1, 76 gallon leak proof tank
DH-4B-3	As DH-4B-1 but with 135 gallon main tank
DH-4B-4	Airways version with 110 gallon main tank
DH-4B-5	Experimental airways conversion by the Engineering Division, similar to the British D.H.4A
DH-4BD	Crop dusting version of DH-4B
DH-4BG	DH-4B fitted with smoke screen apparatus
DH-4BK	Night flying version of DH-4B
DH-4BM	Boeing built single seater for communications, 110 gallon main tank
DH-4BM-1	Two seat dual control variant of DH-4BM
DH-4BM-2	As DH-4BM-1 but with 135 gallon main tank
DH-4BP	Experimental photo reconnaissance version, cameras in front cockpit
DH-4BP-1	DH-4BP adapted for aerial survey, mapping and air to air photos
DH-4BS	Testbed for supercharged Liberty engine
DH-4BT	Dual control trainer
DH-4BW	DH-4B with 300 h.p. Wright H engine
DH-4C	DH-4B with 300 h.p. Packard 1A-1116 or 1A-1237 engine
DH-4L	Slim fuselage for civil use, 185 gallon main tank
DH-4M	Boeing built, steel fuselage, 76 gallon main tank
DH-4M-1	Boeing built DH-4M with modern replacement parts
DH-4M-1K	DH-4M-1 equipped for target towing
DH-4M-1T	Dual control trainer version of DH-4M-1
DH-4M-2	Atlantic built, steel fuselage, 110 gallon main tank
DH-4M-2A	DH-4M-2 equipped for airway use
DH-4M-2K	DH-4M-2 equipped for target towing
DH-4M-2P	Photo reconnaissance version of DH-4M-2, 110 gallon main tank
DH-4M-2S	DH-4M-2 with supercharged engine and 88 gallon main tank
DH-4M-2T	Dual control trainer version of DH-4M-2
DH-4Amb-1	Ambulance version of DH-4B for one stretcher
DH-4Amb-2	Ambulance version of DH-4B for two stretchers
DH-4Ard	Dual navigation trainer, 165 gallon main tank, conversion by the Aviation Repair Depot, Montgomery
O2B-1	As DH-4M-1 but with full U.S. Marine Corps equipment
XCO-7	Boeing conversion of DH-4M-1 for Corps Observation
XCO-7A	As XCO-7 but with wide track undercarriage
XCO-7B	As XCO-7A but with Liberty V-1410 inverted engine
XCO-8	Atlantic conversion of DH-4M-2 with Loening COA-1 mainplanes

Note—All fuel capacities are quoted in U.S. gallons.

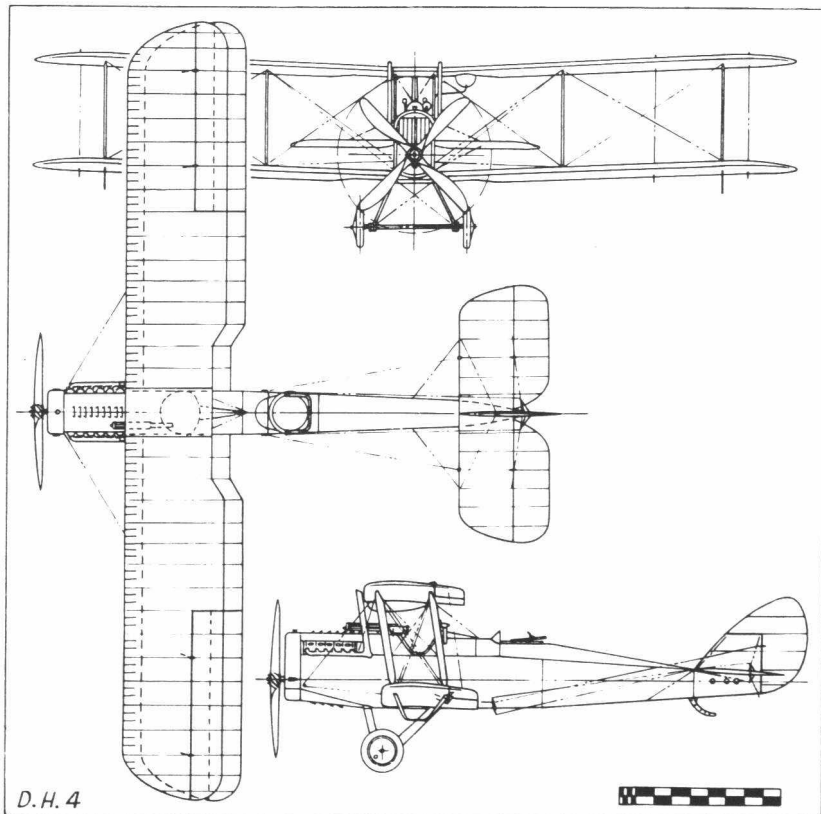
Service Use: (a) In France with R.F.C. Squadron Nos. 18, 25, 27, 29, 49, 55, 57, 97 and 98; and R.N.A.S. Squadron Nos. 5, 6 and 11 (which became R.A.F. Squadron Nos. 205, 206 and 211 on April 1, 1918). (b) Coastal patrols in Belgium by R.N.A.S. Squadron Nos. 2, 5 and 17 (later Nos. 202, 205 and 217). (c) Nos. 212 and 273 Home Defence Squadrons at Port Victoria, Redcar and Great Yarmouth. (d) Overseas with Nos. 30, 63 and 72 Squadrons at Basra; Nos. 220, 221, 222 and 223 in the Aegean Islands of Mudros, Stavros, Thasos, Mitylene and Andrano; Nos. 224, 225, 226 and 227 in the Adriatic; at Archangel in North Russia and Baku on the Caspian Sea. (e) With No. 10 Training Squadron, Harling Road; No. 31 Training Squadron, Wyton; Nos. 51 and 110 Squadrons; Schools of Navigation and Bombing at Stonehenge, Andover and Thetford; the School of Photography, Farnborough; Observers' Schools at New Romney, Manston and Eastchurch; Schools of Aerial Fighting at Marske, Thetford and Turnberry. (f) The 8th, 11th, 20th, 50th, 85th, 96th, 100th, 135th, 155th, 166th, 168th, 278th and 354th American squadrons in France.



The U.S. Army Air Attaché's DH-4B at Stag Lane in 1926. The Naval Air Attaché's DH-4B crashed at Whyteleafe, Surrey on September 21, 1926. (*W. K. Kilsby Photo.*)



One of the forestry patrol D.H.4s used in Canada 1920–24. (*R.C.A.F. Photo.*)



De Havilland D.H.4 (Civil)

Several million pounds worth of war surplus aircraft, including hundreds of D.H.4s, the majority brand new from the Airco and Waring and Gillow factories, were acquired by Handley Page Ltd. in 1919–20 and later reconditioned by the Aircraft Disposal Co. Ltd. at Croydon to become the postwar equipment of the air forces of Spain (14 aircraft), Belgium, Greece, Japan and other small nations. With few exceptions these were powered by the 375 h.p. Rolls-Royce Eagle VIII engine and those for Spain and Belgium were flown out in the autumn of 1921 under temporary civil marks by many well known pilots of the day, including F. T. Courtney, H. Shaw, E. D. Hearne, F. J. Ortweiler, C. D. Barnard, E. L. Foot and Norman Macmillan. In Spain the D.H.4 formed the main equipment of the Air Force training establishment at Cuatros Vientos and was used extensively in the Moroccan War.

Two Eagle powered D.H.4s were also used in a purely civil capacity on the Continental services of Aircraft Transport and Travel Ltd. late in 1919 as temporary crash replacements and two others were shipped to Australia by C. J. de Garis and there fitted with cockpits for two passengers behind the pilot. One of them, *F2691/G-AUCM* was erected and test flown at Glenroy on November 27, 1920 and piloted by F. S. Briggs with the owner as passenger, arrived at Perth on December 2nd after making the first Melbourne–Perth flight in two days. A week later it made the first Perth–Sydney flight, also in two days, and on January 16, 1921 became the first aircraft to fly from Brisbane to Melbourne in one day. Again piloted by F. S. Briggs it left Melbourne on September 9, 1921 to survey the route of the proposed North–South railway and covered 3,000 miles in exactly one month, becoming the first aircraft ever to land at Alice Springs. From

August 1924 it carried mail on the Adelaide–Sydney service of Australian Aerial Services Ltd. with the name “Scrub Bird” and was still flying miners and supplies between Port Moresby and Lae, New Guinea for Bulolo Goldfields Ltd. in 1927.

C. J. de Garis sold the other D.H.4, F2682/G-AUBZ to R. J. P. Parer who flew it to victory in the first Australian Aerial Derby on December 28, 1920 at 142 m.p.h. It was then used for joyriding and other pioneering work until delivered to QANTAS at Longreach by rail on August 12, 1922. In the last two months of the year it covered over 5,000 air miles, mainly on the Charleville–Cloncurry mail service but was extensively damaged when it struck telephone wires while landing at Gilford Park station, south west of Longreach, on June 6, 1923. During repairs the two open passenger cockpits were roofed over to make an open-sided cabin and it first flew in this form in May 1924. It opened the extension service between Cloncurry and Camooweal on February 7, 1925 piloted by Capt. L. J. Brain but, when ousted by the new D.H.50s at the end of 1927, was sold to Matthews Aviation Ltd. at Essendon Aerodrome, Melbourne where the fuselage was modified for joyriding with no less than four separate passenger cockpits behind the pilot. At this stage it was named “Cock Bird” on the fin but in 1930 it returned to taxi work with a full D.H.4A-style cabin with sliding windows as “Spirit of Melbourne”. It was last in service with Pioneer Air Services who acquired it in September 1934.

In Canada, all 12 Imperial Gift D.H.4s were equipped with air to ground W/T sets for use on forestry patrol work by the Air Board Civil Operations Branch and in 1921 one of these aircraft made the first recorded geological reconnaissance flight piloted by F/Lt. A. W. Carter. From August 1920 their pilots spotted hundreds of forest fires and helped save millions of dollars worth of timber, operating mainly from an airstrip at



The veteran D.H.4 three seater G-AUBZ of Queensland and Northern Territory Aerial Services Ltd. at Longreach in March 1923. A cabin top was fitted later.



G-AUBZ “The Lachlan” modified for joyriding at Melbourne/Essendon in 1929 with five open cockpits and two ex QANTAS F.K.8 fuel tanks above the centre section.
(R. S. Mitchell by courtesy of QANTAS.)



The veteran D.H.4 G-AUBZ in service with Matthews Aviation Ltd. 1930 in its final form as D.H.4A VH-UBZ “Spirit of Melbourne” with D.H.50 centre section tank.
(QANTAS Photo.)

High River, Alberta where the D.H.4’s performance alone could combat wind ridden skies near the Rockies. Special skis were designed for winter flying and as late as 1924 these veterans continued to give photographic coverage of the district but by that time showed such deterioration that they were permanently grounded at the end of the season. The one exception, G-CYDM, still airworthy in 1927, was reworked to D.H.4B standard with underslung radiator and observation panels in the lower wing roots.

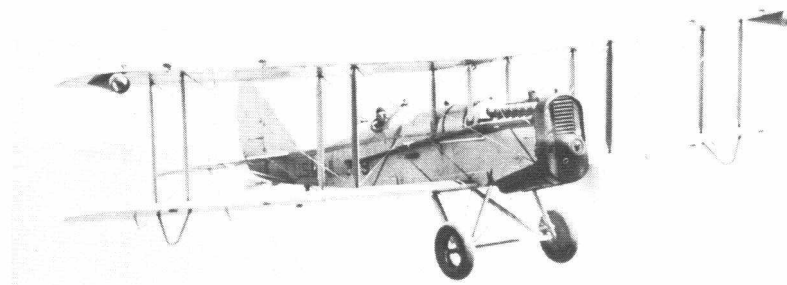
The D.H.4's greatest contribution to the embryo air transport industry however, was made in Europe by four machines supplied by Handley Page Ltd. to the Belgian concern Syndicat National pour l'Etude des Transports Aeriens (SNETA). In company with a number of D.H.9s, they ran spasmodically on the Brussels-London, Brussels-Paris and Brussels-Amsterdam services in 1920-21, and although their normal London terminal was Croydon, many flights terminated at Cricklewood for convenience of servicing. After the departure to Brussels of D.H.4 *O-BABI* on January 15, 1921, Cricklewood was used no more and the D.H.4's commercial life ended soon afterwards in two major crashes and the destruction of most of the SNETA fleet in a disastrous hangar fire at Brussels on September 27, 1921. An accompanying table lists all the civil D.H.4s for which records still exist.

Apart from two machines employed by Aircraft Transport and Travel Ltd. as temporary replacements for crashed D.H.4As, the standard D.H.4 saw little civilian service in England. On June 21, 1919 however, Marcus D. Manton came third at an average speed of 117.39 m.p.h. in the Aerial Derby at Hendon in *K-142*, a new aircraft with Rolls-Royce Eagle VIII, specially demilitarised by the Aircraft Manufacturing Co. Ltd. It competed against a 'one-off' racing version registered *K-141* and designated D.H.4R to signify D.H.4 Racer. This monster was built in ten days by an enthusiastic team led by F. T. Hearle who fitted a 450 h.p. Napier Lion with chin radiator, clipped the lower mainplane at the first bay and braced the overhanging portion of the upper wing by slanting struts. Without stagger and with the rear cockpit faired over, it was scarcely recognisable as a D.H.4 derivative but Airco test pilot Capt. Gerald Gathers flew it twice round London in 1 hour 2 minutes and set up a British closed circuit record of 129.3 m.p.h. This was indeed a creditable day's flying by two machines which had left the ground for the first time only that morning!



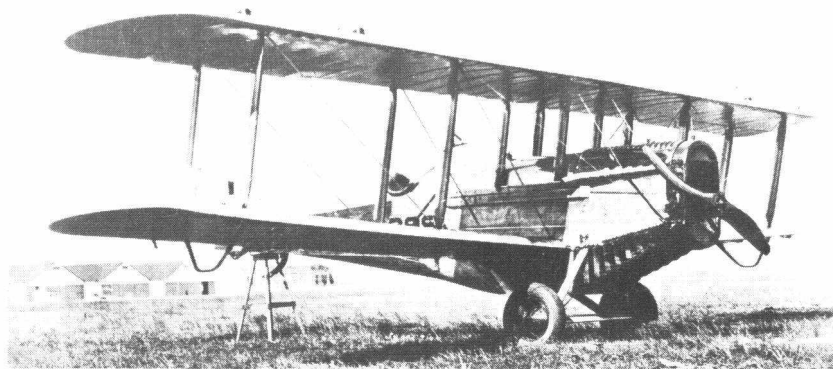
The record breaking D.H.4R racer photographed at Hendon after the 1919 Aerial Derby.
(By courtesy of Jean Alexander.)

The one other British civil example was *G-EAMU* acquired by the shipping firm of S. Instone and Co. Ltd., primarily for the fast carriage of ship's papers but also accommodating two passengers in the open rear cockpit. With Capt. F. L. Barnard as pilot and appropriately named "City of Cardiff", it emulated the Aerial Derby machines by making its first flight on the morning of October 13, 1919, a return flight to the Welsh capital in the afternoon and its maiden trip to Paris the next day. During 1920 several trips were made to Paris, Brussels, Nice, and on one occasion, to Prague.



A single seat DH-4B mail plane of the United States Postal Department fitted with wingtip landing lights.

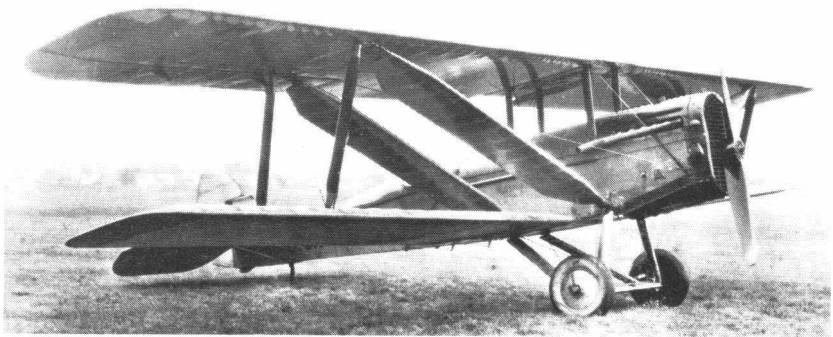
In America DH-4s with Liberty 12 motors went into regular service with the United States Postal Department on August 12, 1918 and from June 1919 onwards a considerable number of DH-4Bs and DH-4Ms were converted for the carriage of 400 lb. of mail in a watertight compartment that had once been the front cockpit. The aircraft was thereafter flown from the rear as a single seater. In addition, thirty machines were reconstructed by the Lowe, Willard and Fowler Engineering Company to have increased span, two 200 h.p. Hall-Scott L-6 watercooled engines outboard and a large mail compartment in the nose. One normal DH-4B, *No. 299*, was given a special fuselage having a cargo hold for 800 lb. of mail between the undercarriage legs. New wings of modified section were built by the Aeromarine Company and in 1922 *No. 299* carried a record load of 1,032 lb. from New York to Washington at its economical cruising speed of 68 m.p.h. Other important and unusual DH-4 mailplanes included one fitted with Wittemann-Lewis unstaggered wings and strengthened centre section as well as several rebuilt by G. I. Bellanca with new, single bay, sesquiplane wings braced by his patent inclined lift struts. Pioneer mail pilots, not the least of whom was Charles Lindbergh, flew the DH-4s night and day in any weather between New York, Washington, Cleveland, Chicago and Omaha, finally linking the East and West coasts when the final section to San Francisco was opened in August 1920. The bass Liberty voice of the veteran DH-4s spanned the continent until 1927,



No. 299, the special postal DH-4B with Aeromarine wings and underslung mail compartment.



The DH-4B mailplane with Wittman-Lewis unstaggered wings and strengthened centre section.



One of a number of U.S. Mail single seaters rebuilt by Bellanca with single bay sesqui-plane wings braced by Bellanca lift struts, and fitted with ailerons on the upper mainplane only.

by which time many had been equipped with large belly tanks giving incredible range, and enormous cone shaped floodlights for night landings in rough pasture at small townships en route. Surviving in the U.S.A. in 1987 were *N249B* (rebuilt 1961–68 with parts and engine recovered from its 1922 crash site in Utah) at the National Air and Space Museum, Washington; *N489* at the Dayton U.S.A.F. Museum; and the Airco-built *A2169* (once used in films as *NX3258*). The last, formerly part of the 'Wings and Wheels' Collection was sold to a private owner from Georgia in 1981.

SPECIFICATION AND DATA

Manufacturers: The Aircraft Manufacturing Co. Ltd., Hendon, London, N.W.9, and the sub-contractors listed on page 60.

Power Plants: (D.H.4) One 375 h.p. Rolls-Royce Eagle VIII
(DH-4) One 400 h.p. Liberty 12
(D.H.4R) One 450 h.p. Napier Lion

Dimensions, Weights and Performances:

	D.H.4	DH-4	D.H.4R
Span	42 ft. 4 $\frac{1}{2}$ in.	42 ft. 5 $\frac{1}{2}$ in.	42 ft. 4 $\frac{1}{2}$ in.
Length	30 ft. 6 in.	30 ft. 6 in.	27 ft. 5 in.
Height	11 ft. 0 in.	10 ft. 3 $\frac{1}{2}$ in.	11 ft. 0 in.
Wing area . . .	434 sq. ft.	440 sq. ft.	—
Tare weight . .	2,387 lb.**	2,391 lb.	2,490 lb.
All-up weight .	3,472 lb.	4,297 lb.	3,191 lb.
Maximum speed .	143 m.p.h.	120 m.p.h.*	150 m.p.h.
Landing speed .	50 m.p.h.	60 m.p.h.*	—
Initial climb . .	1,300 ft./min.	1,000 ft./min.*	—
Ceiling	23,500 ft.	19,500 ft.	—
Endurance . . .	3 $\frac{3}{4}$ hours	3 hours	—

* No. 299 modified: 115 m.p.h., 50 m.p.h., 800 ft./min. respectively.

** *G-AUBZ* with cabin: 2,403 lb. Cruising speed, 85 m.p.h.



NC489, one of the few surviving United States postal DH-4s, in its permanent home at Dayton U.S.A.F. Museum. (By courtesy of Leslie Hunt.)

D.H.4s Used for Civil Purposes:

R.A.F. serial	Registration	Last owner	Disposal
F2670	G-EANK	A.T. & T. Ltd.	Sold abroad 4.20
F2671	G-EANL	A.T. & T. Ltd.	Sold abroad 4.20
F2682	G-AUBZ	Pioneer Air Service	Struck off register 10.1.40
F2691	G-AUCM	Morlae Airline, Lae	Withdrawn from use 30.6.30
H5915	O-BAIN	SNETA	Crashed at Folkestone 25.1.21
H5925	O-BABI	SNETA	Crashed at Croydon 26.2.21
H5931	O-BALO	SNETA	Crashed at Strasbourg 5.5.24
H5936	O-BADO	SNETA	Burned at Brussels 27.9.21
H5939	G-EAMU	S. Instone and Co. Ltd.	Converted to D.H.4A in 1921

Markings carried by the Canadian Air Board Civil Operations D.H.4s

F2672 . G-CYBW	F2706 . G-CYDM*	F2709 . G-CYBU	F2712 . G-CYDL
F2673 . G-CYDB	F2707 . G-CYEM	F2710 . G-CYBV	F2713 . G-CYCW
F2705 . G-CYBO	F2708 . G-CYDN	F2711 . G-CYDK	F2714 . G-CYEC

* Later converted to D.H.4B, equivalent to the American DH-4B.

D.H.4s Ferried to the Belgian and Spanish Air Forces 1921:

To Belgium—	F2680 . G-EAXO	F2697 . G-EAXE	F5797 . G-EAYV
A7988 . G-EAXH	F2684 . G-EAYH	F2698 . G-EAXI	H5896 . G-EAYX
F2675 . G-EAYE	F2686 . G-EAXD	F5774 . G-EAXP	H5898 . G-EAYS
F2677 . G-EAYJ	F2689 . G-EAYR	F5779 . G-EAYF	H5902 . G-EAYG
F2678 . G-EAXN	F2693 . G-EAYI	F5794 . G-EAXJ	H5934 . G-EAXF
To Spain—At least M-MHAC and M-MHDE to M-MHEN			

United States Postal DH-4s: Serial numbers 60 to 110 together with many which retained whole or part of their former military serials, e.g. 3212, 24224, 24227 and 24239. From 1928 at least NS-1 to NS-13 and NS-89; NC93 to NC118, NC299, 332, 449, 489, 640, 812, 915, 1487, 1488, 1498, 1827, 1828, 1934, 3211, 3258, 3360, 3361, 3494, 5629, 7588, 9350; NC57E, 65E, 278E; NC97M ex 23-707; NC299V. One postal conversion only by Boeing, c/n 652.



A Lowe, Willard and Fowler DH-4B postal conversion with two 200 h.p. Hall-Scott L-6 engines. Others had 150 h.p. Hispano-Suizas.

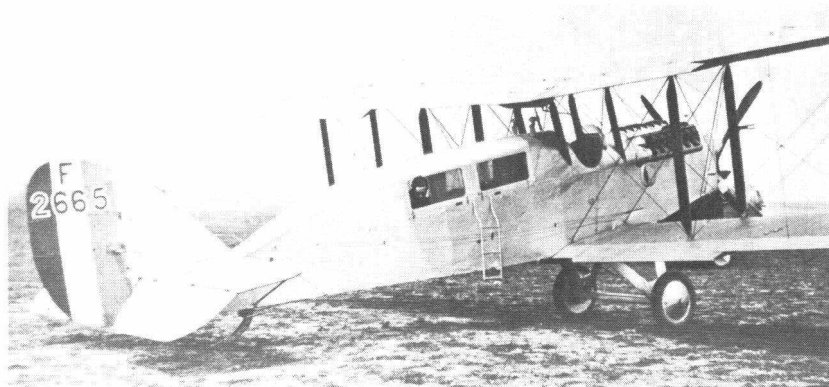


F2664, "H.M.A.P. Lady Iris", one of the D.H.4As used on the cross-Channel services of No. 2 (Communications) Squadron, R.A.F., in 1919. (Crown Copyright Reserved.)

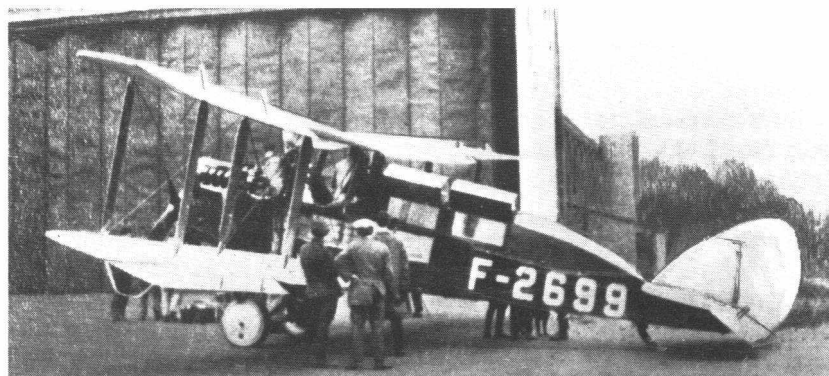
De Havilland D.H.4A

Formed in March 1919 under the command of Major J. R. McCrindle to meet increased cross-Channel passenger traffic arising from the Armistice, No. 2 (Communication) Squadron, 86th Wing, R.A.F. operated between Kenley and Buc, near Paris with D.H.4s. During the sittings of the Peace Conference a daily courier and mail service was operated in each direction and many Cabinet Ministers availed themselves of this new means of rapid transport, including Mr. Bonar Law, Mr. Winston Churchill, Lord Milner, Major General Sykes and W. M. Hughes, Prime Minister of Australia. At the special request of Mr. Bonar Law, a number of Eagle VIII powered D.H.4s were modified to accommodate a Minister and his secretary face to face in a glazed cabin so that work and conversation might be continued in comfort during the flight. This cabin was a light fabric covered wooden structure fitted with sliding Triplex windows, the starboard side and roof being hinged to fold upwards for entry and exit. A curved decking then faired the cabin neatly into the tail unit. Normal D.H.4 fuel tanks were retained behind the pilot and the two familiar wind driven fuel pumps were mounted above them, but to compensate for the weight of the extra passenger so far back, the aircraft was re-rigged with the upper mainplane 12 inches aft of its usual position. Thus, unlike the D.H.4, the cabin model was unstaggered and therefore a major variant to which the designation D.H.4A was allotted.

Under the command of Wg. Cdr. W. Harold Primrose, the Communication Squadron made history on June 28, 1919 not only by flying four D.H.4As in line astern over the Palace of Versailles during the signing of the Peace Treaty but also by carrying Mr. Bonar Law from Buc to Kenley with the Prime Minister's historic letter to the King advising him that the Treaty had just been signed. When the squadron disbanded in September 1919 the D.H.4As were sold to Handley Page Ltd. among hundreds of



F2665, third D.H.4A conversion for No. 2 (Communication) Squadron. (Crown Copyright Reserved.)



F2699 refuelling at Marske-by-the-Sea, Co. Durham, early in 1919. It became G-EAHF with A.T. & T. Ltd. in the following August. (E. J. Arnsby Photo.)



Aircraft Transport and Travel Ltd.'s second D.H.4A, G-EAHG, during demonstrations at Interlaken in October 1919.

other war surplus machines.

In July 1919 four new D.H.4s from the Glendower production line were also converted into D.H.4As for Airco's operating subsidiary Aircraft Transport and Travel Ltd. and flew initially with enlarged military serial numbers. Piloted by Capt. E. H. 'Bill' Lawford, one, G-EAJC, is now famous as the machine which carried G. M. Stevenson-Reece of the *Evening Standard* and a consignment of grouse, newspapers, leather and Devonshire cream from Hounslow to Le Bourget in 2 hours 30 minutes on August 25th.

In the same month another D.H.4A, G-EAHG, was demonstrated by H. J. Saint at the First Air Traffic Exhibition (ELTA) at Amsterdam and in the following October at Interlaken, Switzerland by Major Stewart-Wortley. On November 10th, its sister craft 'HF' carried the first civilian air mail to France at a fee of 2/6 per ounce. Unfortunately both 'HF' and 'HG' were lost in serious crashes while trying to maintain their schedules without wireless during the appalling winter of 1919, and were replaced by the open cockpit D.H.4s G-EANK and 'NL' mentioned on page 76. All A.T. & T. aircraft were based at Hendon, positioning flights being made to Hounslow to pick up passengers and clear Customs until the new terminal aerodrome opened at Plough Lane, Croydon on April 1, 1920. The D.H.4s then operated both to Le Bourget and Schiphol but with fares at 20 guineas a head, could not compete with subsidised foreign air lines and were scrapped when A.T. & T. Ltd. went into liquidation on December 15, 1920.

A number of nil hour D.H.4s had also been obtained by Handley Page Ltd. direct from the works of Waring and Gillow Ltd., and one of these was converted to D.H.4A standard as G-EAVL for use on the Cricklewood-Le Bourget and Schiphol services of Handley Page Transport Ltd. On

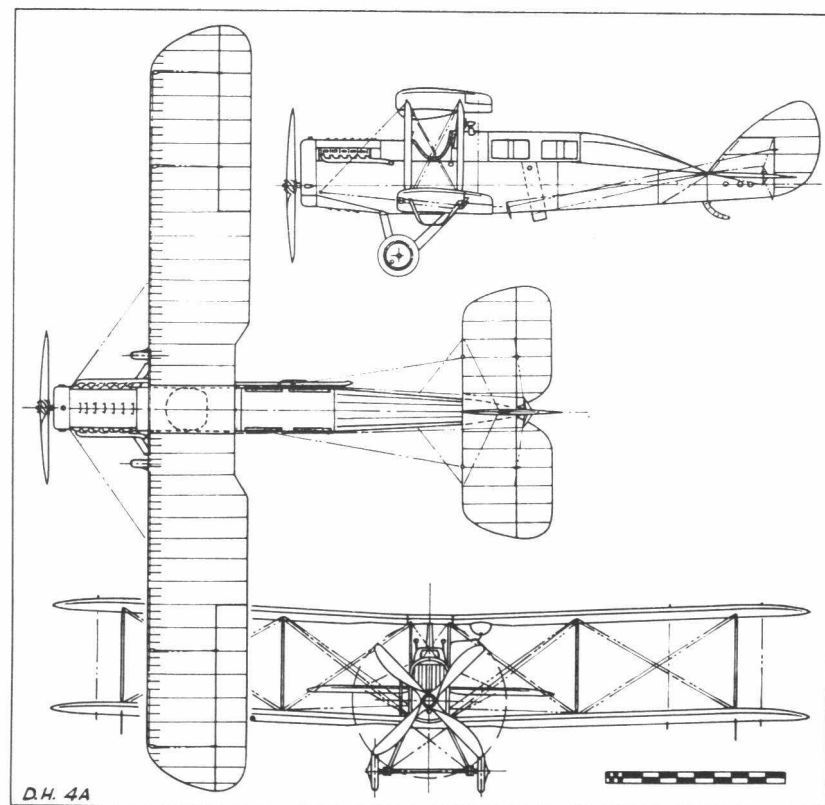


The Cricklewood-based D.H.4A G-EAVL used by Handley Page Transport Ltd. from November 1920 until April 1921. (Handley Page Photo.)

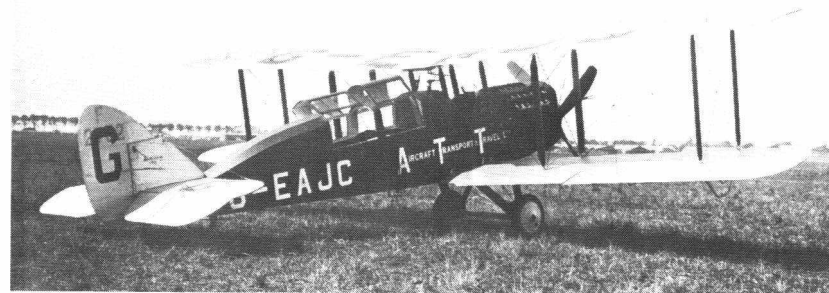
December 4, 1920 piloted by Lt. Vaughan Fowler, it created a record by flying to Paris in half a gale with two passengers in an hour and 48 minutes. Two other D.H.4As, *O-BARI* and *O-BATO*, were also produced for the company's Belgian customer SNETA, which used them on the Brussels-Croydon route in 1920-21. They were joined in April 1921 by one of the Communications Squadron D.H.4As *F5764*, acquired by Handley Page Ltd. among the surplus stock and reconditioned for civil use as *G-EAWH*.

Another of the original military D.H.4As was shipped to Buenos Aires by Maj. S. G. Kingsley of the River Plate Aviation Co. Ltd., who in August 1920 made a pioneer business trip of 1,250 miles from Buenos Aires to Porto Alegre on charter to an Argentine bank. In the following year this D.H.4A was joined by a D.H.6 and a D.H.16 which together covered a total of 40,000 miles in the Argentine, Brazil and Uruguay.

One other and better known D.H.4A also existed, in the shape of the Instone D.H.4 *G-EAMU* mentioned on page 73, fully converted to D.H.4A standard at Hamble by A. V. Roe and Co. Ltd. in February 1921. Renamed "City of York" it flew the Croydon-Paris route in the livery of



Instone Air Line Ltd., and made charter flights to the North and to Ireland. After reconditioning at Northolt by the Central Aircraft Company, 'MU made history on September 8-9, 1922 by flying from Croydon to Renfrew and back, piloted by Capt. F. L. Barnard, at an average speed of 123 m.p.h. to win the first of all the King's Cup Races.



G-EAJC, the D.H.4A in which E. H. Lawford flew the first British commercial service from Hounslow to Le Bourget on August 25, 1919. The former R.A.F. serial *F2702* is visible on the rudder.

SPECIFICATION AND DATA

Conversions by: The Aircraft Manufacturing Co. Ltd., Hendon, London, N.W.9
Handley Page Ltd., Cricklewood, London, N.W.2

Power Plant: One 350 h.p. Rolls-Royce Eagle VIII

Dimensions: Span 42 ft. 4½ in. Length 30 ft. 6 in.
Height 11 ft. 0 in. Wing area 434 sq. ft.

Weights: Tare weight 2,600 lb. All-up weight 3,720 lb.

Performance: Maximum speed 121 m.p.h.

Production:

	R.A.F. Serial and Registration	C. of A. Issued	Remarks
<i>F2694</i>	<i>G-EAHG</i>	12. 8.19	A.T. & T. Ltd., forced down in the English Channel 29.10.19
<i>F2699</i>	<i>G-EAHF</i>	12. 8.19	A.T. & T. Ltd., crashed at Caterham 11.12.19
<i>F2702</i>	<i>G-EAJC</i>	19. 8.19	A.T. & T. Ltd., scrapped 11.20
<i>F2704</i>	<i>G-EAJD</i>	25. 8.19	A.T. & T. Ltd., scrapped 11.20
<i>F5764</i>	<i>G-EAWH</i>	18. 4.21	Handley Page Ltd., scrapped 1922
<i>H5905</i>	<i>G-EAVL</i>	11.11.20	Handley Page Ltd., crashed 4.21
<i>H5928</i>	<i>O-BARI</i>	—	SNETA, burned in hangar fire at Brussels 27.9.21
<i>H5929</i>	<i>O-BATO</i>	—	
<i>H5939</i>	<i>G-EAMU</i>	19. 2.20	Instone Air Line Ltd. "City of York"; to Imperial Airways Ltd. 10.6.24

Service Use: at least *F2663*, *F2664*, *F2665*, *F2681*, *F5764*, *H5894* and *H5934* by No. 2 (Communication) Squadron. *H5894* crashed into the English Channel 15.5.19 with the loss of Capt E. B. B. Jefferson and Mr A. Aarsohn, the Zionist leader and agricultural expert.

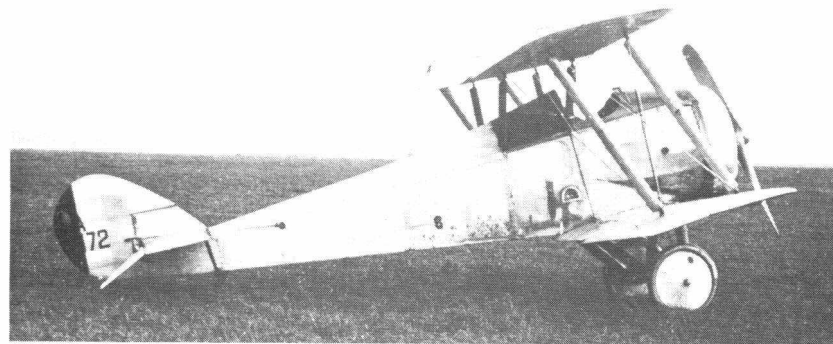


The flat sided D.H.5 prototype A5172 with small horn balanced rudder. (*Airco Photo.*)

De Havilland D.H.5

Continued use of the D.H.2 and other pusher scouts by the R.F.C. in 1916 was due mainly to the lack of a suitable British interruptor gear to enable the guns to fire forward through the airscrew. In that year however, Constantinesco perfected such a mechanism and Capt. Geoffrey de Havilland was at last able to produce a replacement aircraft known as the D.H.5 which combined the enhanced performance of the tractor biplane with the pusher's ability to fire forward. He also sought to retain the pusher pilot's magnificent all round view by rigging the D.H.5 with 27 inches of backward stagger to bring the pilot's cockpit in front of the leading edge of the upper mainplane. The fuselage of the prototype, A5172, was a wire braced, wooden box girder, strengthened with plywood at the forward end. It had rounded top decking and flat sides carrying short fairings behind the familiar circular cowl of the 110 h.p. Le Rhône rotary. The main fuel tank was behind the pilot's seat and surmounted by the oil tank but there was also an auxiliary gravity tank fitted on top of the starboard mainplane. Mainplanes were of the usual two spar type, with spindled spars and the small horn balanced rudder was of typical de Havilland outline. Flight trials showed the rudder to be ineffective during take off and a slightly larger one of similar shape was then fitted. Armament consisted of a single Vickers gun on top of the front fuselage, conveniently placed where the pilot could clear any stoppages.

Some 550 D.H.5s were built, 200 by the Aircraft Manufacturing Co. Ltd. and the remainder by three main sub-contractors, but only 483 went into service with the Royal Flying Corps. A single aircraft, B7775, was



The prototype D.H.5 bearing R.F.C. serial A5172.

also built by No. 1 (Southern) Aeroplane Repair Depot. Production aircraft differed from the prototype by virtue of their unbalanced rudders, and their fuselages were faired to a circular section behind the engine and tapered to an octagonal section towards the tail. One was experimentally fitted with a 110 h.p. Clerget rotary and another, A9186, was fitted with a Vickers gun firing forwards and upwards at 45 degrees. Service trials were conducted in France at the end of 1916 and Nos. 24 and 32 Squadrons, which had taken the first D.H.2s to France some two years earlier, were issued with the first production versions in May 1917. Several other squadrons were re-equipped during the ensuing six months.

The D.H.5 was immensely strong, fully aerobatic, and a pleasant aeroplane to fly but a number of training accidents led to a widespread and unfounded belief that its unorthodox layout imparted a high stalling speed and made recovery from a spin difficult. In squadron service, flown



No. 24 Squadron D.H.5, A9435, in enemy hands at Adlersdorf in August 1917 after the pilot, Lt. Robertson, had been taken prisoner. (*J.M.B./G.S.L. Collection.*)



Production D.H.5, A9456, built by the Darracq Motor Engineering Co. Ltd.

by experienced pilots, it proved quite docile but at heights above 10,000 ft. was easily outflown by contemporary fighters such as the Sopwith Pup. German combat reports claimed the shooting down of several D.H.5s including A9201, A9363 and A9435, some by Manfred von Richtofen on November 23, 1917 and the rest by other pilots a week later. The D.H.5 was consequently relegated to ground attack duties and in the Battle of Ypres in August 1917, enemy trenches and machine gun posts received close attention from D.H.5s of No. 41 Squadron. In November 1917 those of No. 64 and 68 Squadrons carried out low level formation attacks during the Battle of Cambrai, each aircraft carrying four 25 lb. Cooper bombs. As in the case of the D.H.4, many aircraft were provided by public subscription and received individual names such as A9242 "Australia No. 15, N.S.W. No. 14, The Women's Battleplane", A9357 "Tacati", A9414 "Dungarpur", A9415 "Australia No. 8, N.S.W. No. 7, Government", A9432 "Australia No. 16, N.S.W. No. 15, Government", A9513 "Benin", and B371 "Solanki".

Darracq-built D.H.5 A9403 was tested at Farnborough in September 1917 with plywood covered fuselage and Lott detachable petrol tank but the project was brought to an end by poor engine performance.

SPECIFICATION AND DATA

Manufacturers: The Aircraft Manufacturing Co. Ltd., Hendon, London, N.W.9
The Darracq Motor Engineering Co. Ltd., Townmead Road, Fulham, London, S.W.6
March, Jones and Cribb, Leeds
British Caudron Co. Ltd., Broadway, Cricklewood, London, N.W.2

Power Plants: One 110 h.p. Le Rhône
One 110 h.p. Clerget

Dimensions: Span 25 ft. 8 in. Length 22 ft. 0 in.
Height 9 ft. 1½ in. Wing area 212.1 sq. ft.

Weights and Performances:

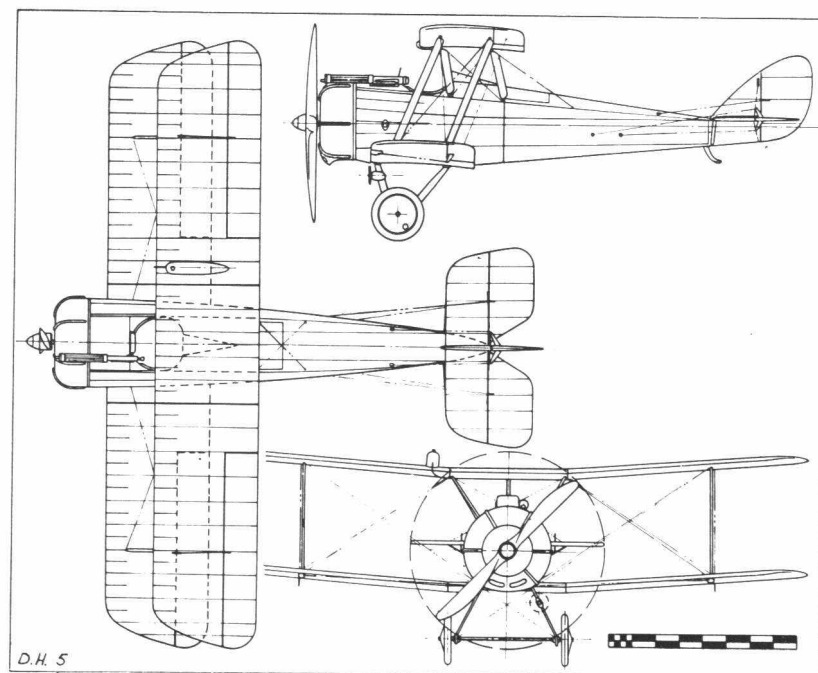
	Prototype	Production	A9403
Tare weight . . .	1,006 lb.	1,010 lb.	985 lb.
All-up weight . . .	1,486 lb.	1,492 lb.	1,430 lb.
Maximum speed . . .	110 m.p.h.	109 m.p.h.	104 m.p.h.
Initial climb . . .	1,000 ft./min.	1,200 ft./min.	1,200 ft./min.
Service ceiling . . .	14,000 ft.	16,000 ft.	—
Endurance . . .	3 hours	2¾ hours	—

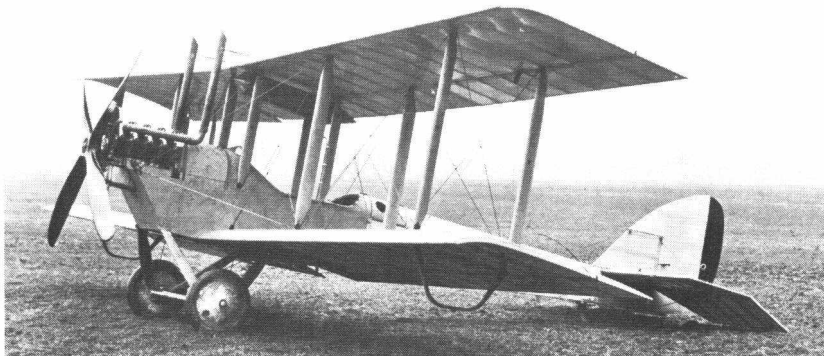
Production:

Serial range	Manufacturer	Serial range	Manufacturer
A9163 to A9361 A9363 to A9562	Airco Darracq	B331 to B380 *B4901 to B5000	British Caudron March, Jones and Cribb
Other single aircraft: A5172 (prototype), B7775			

* Not all completed.

Service Use: (a) On the Western Front with Nos. 24, 32, 41, 64 and 68 Squadrons R.F.C. (b) With the Advanced Air Firing School at Lympne. (c) With Schools of Aerial Fighting at Freiston, Marske, Sedgeford and Turnberry.





One of the two D.H.6 prototypes, with traditional de Havilland rudder. (*Airco Photo.*)

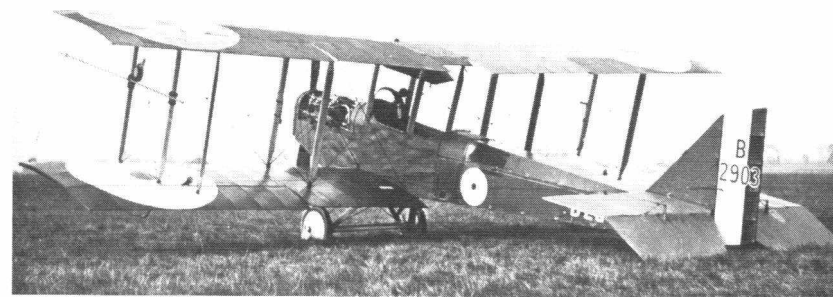
De Havilland D.H.6

The D.H.6 was a primary trainer conceived in 1916 to meet the increasing needs of the Royal Flying Corps, at that time expanding in readiness for the decisive battles of 1917–18. As the requirement was urgent, beauty of line and fine performance were deliberately sacrificed for ease and speed of manufacture and cheapness and simplicity of repair. All major assemblies were straight sided, upper and lower mainplanes were interchangeable and the wing tips were square cut. The airframe was of fabric covered, wire braced, wooden construction but the front fuselage was plywood covered for additional strength, the tail surfaces were of steel tubing with wooden ribs and the rubber-sprung axle of the undercarriage lay between two protecting steel spreader bars. Both occupants sat in a communal cockpit of a shape familiar to Australians to whom the D.H.6 was always “The Dung Hunter”, and the instructor was provided with a lever with which to disengage the pupil’s controls in an emergency. Heavily cambered mainplanes, braced by cables instead of streamlined wires also earned the D.H.6 the more common titles of “The Clutching Hand” and “Sky Hook”. There were others!

Power was provided by a 90 h.p. R.A.F. 1A eight cylinder V aircooled motor, bolted straight to the top longerons without any cowlings other than a scoop on the top to direct cooling air to the back cylinders, while vertical stacks led the exhaust fumes away over the top wing. On a mere 90 h.p. the performance was lady-like in the extreme but the D.H.6 was utterly viceless and would remain airborne at an air speed of 30 m.p.h. It was a very remarkable aeroplane, which the designer deliberately made unstable so that it would be an efficient elementary trainer.

The prototype D.H.6s A5175 and A5176 were fitted with the typical D.H. rudder but production machines, built by Airco and seven sub-

contractors, had rectilinear rudders. At least 2,282 D.H.6s were built, some 600 less than those actually ordered, most of which saw widespread service with Training Squadrons during 1917 in the United Kingdom, the Near East and at Point Cook in Australia. It also became the communications aircraft of many Home Defence Squadrons, so that production soon outstripped that of the R.A.F. 1A engine, making it necessary to equip some production batches with the 80 h.p. Renault and the 90 h.p. Curtiss OX-5. The Curtiss OX-5 powered D.H.6 was selected as an alternative in the event of difficulty being experienced with the Canadian JN-4 programme. Although this contingency did not arise, the single D.H.6 completed in July 1917 by Canadian Aeroplanes Ltd. and successfully flown, was the first British designed aircraft built in Canada.

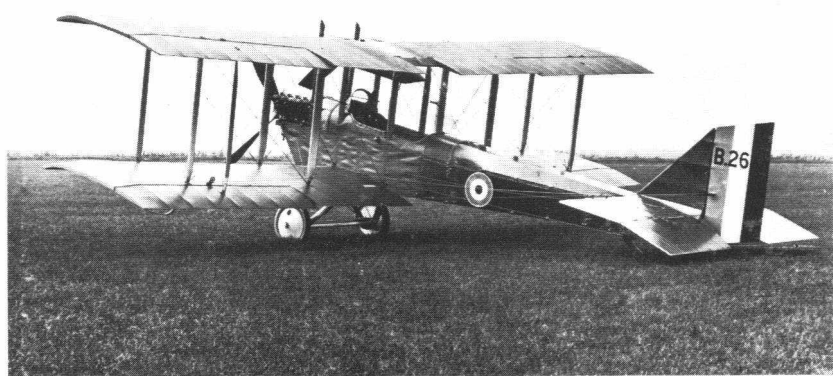


D.H.6 with 90 h.p. Curtiss OX-5 engine. (*J.M.B./G.S.L. Collection.*)

At the end of 1917 the Avro 504K became the R.F.C.’s standard trainer and over 300 D.H.6s were transferred to the Royal Naval Air Service for anti-submarine duties around British coasts, and for operation by United States Navy personnel on similar patrols off the North East coast of Ireland. Usually they were flown solo and carried up to 100 lb. of bombs under the wings but their only noteworthy attack was the unsuccessful bombing of U boat *U.C.49* on May 30, 1918. A report issued in the same month attributing a number of accidents to the difficulty of flying an unstable aeroplane on long patrols, was followed by a number of remedial experiments. F3386 was modified by Airco and tested at the R.A.E. Farnborough in July 1918 with 10 inches of back stagger and a less cambered wing section, obtained by reducing mainplane chord from 6 ft. 3 in. to 6 ft. 0 in. Elevator chord was also reduced from 2 ft. 6 in. to 1 ft. 6 in., but in an otherwise identical set of modifications made to B2963 by the R.A.E., elevator chord shrank to 1 ft. 5 in. Yet another experiment involved the re-rigging of B2840 with 13½ inches of back stagger. Ultimately the Airco modification was standardised and in this form the aircraft was sometimes referred to as the D.H.6A. Forced

landings at sea were frequent and one R.A.F. engined machine was tested with flotation gear but even without this, the D.H.6 had been known to remain afloat for 10 hours.

At the end of 1918 the R.A.F. still had 1,050 D.H.6s on charge, and in the following year the majority were declared obsolete and sold. Surplus aircraft auctioned at Hendon on June 2, 1919 included a number which fetched prices ranging from £60–£100 according to condition. About 40 were overhauled for pleasure flying within the United Kingdom during the ensuing 14 years and others were privately owned. In Australia the Point Cook machines were also declared redundant and six of these, together with one built from spares, did valuable pioneer work. *B2802* and *B2803*, bought by the Aerial Co. Ltd. were ferried to Sydney by Capt.



B2612, a production D.H.6 with large rudder and elevator. (Imperial War Museum Photo Q.68131.)



An Airco-built aircraft, *B2840*, in the so-called D.H.6A configuration with back stagger and reduced rudder and elevator chord. (Imperial War Museum Photo MH.3527.)

P. G. (later Sir Gordon) Taylor M.C. and F/Lt. R. F. Oakes in 9¾ hours flying time but with frequent refuelling stops the flight took from March 31, 1920 until April 8th. Great difficulty was experienced in crossing the mountains against headwinds and at one stage only four miles were covered in 25 minutes. Another D.H.6 was flown from Richmond to Bathurst by Lt. C. V. Ryvie on August 6, 1920, two were ferried to Hamilton, Victoria by Capt. R. W. McKenzie M.C. and Capt. S. G. Brearley D.F.C. for joy-riding, and the sixth was similarly operated at Bendigo, further to the north, by Lt. H. Treloar A.F.C. One of these machines, *G-AUBO*, later acquired by F. T. O'Dea and P. A. Moody, covered 12,000 miles in 1921 without a single forced landing.



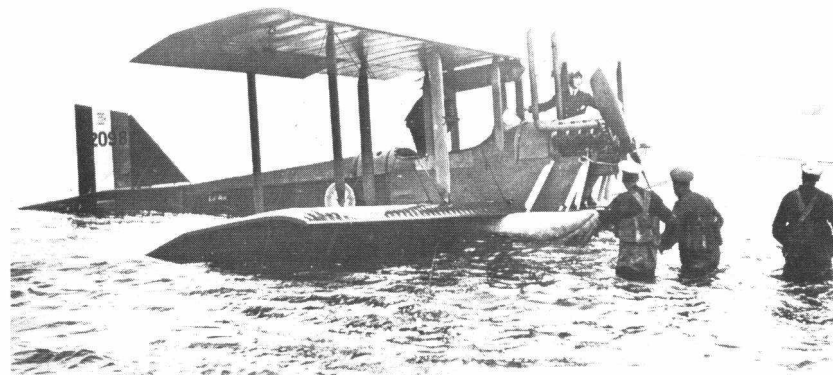
A Spanish-built D.H.6 with rounded rudder, 140 h.p. Hispano-Suiza watercooled engine and Lamblin radiators between the undercarriage legs. (J.M.B./G.S.L. Collection.)

In the United States, Chamberlain Aircraft Inc. of New Jersey offered remodelled D.H.6s having forward stagger, individual cockpits and an improved fuel system. At least one is said to have been fitted with a 150 h.p. Benz engine, and as late as 1929 others were re-engined with 110 h.p. Clerget rotaries for 'barnstorming' purposes, e.g. *2264*, *4066* and *4124*.

As a result of a sales tour made in 1919–20 by Maj. Hereward de Havilland in a Lion engined D.H.9, a number of D.H.6s were sold in Spain. One of these, *M-AAAB*, registered to Hispano-Britannica S.A. of Madrid in February 1920 is believed to have acted as 'prototype' for the 60 built under licence at Guadalajara from 1921 onwards. These were used at the main Air Force training establishment at Cuatros Vientos and also at Alcala de Henares. At least one belonged to a Royal Flight. Hispano-built D.H.6s had centre section fuel tanks of aerofoil section, wings of reduced camber and the 140 h.p. Hispano-Suiza engine. A few were later sold for civil use, one being flown by the Aero Club of Barcelona in 1932 and three by Aero Popular S.A. of Madrid in 1933.

The civil D.H.6, numbered *K-100*, was noteworthy as the first aeroplane in the United Kingdom to fly in civil markings. It also differed from other D.H.6s in combining wings of reduced camber with normal unstaggered rigging, vertical tail surfaces of D.H. outline as fitted to the prototypes, separate cockpits and a curved cowling round the lower half of the engine. It was flown a great deal by Airco test pilot Gerald Gathergood at Hendon race meetings in the summer of 1919 and was afterwards sold to the Marconi Wireless Telegraph Co. Ltd. for radio telephony experiments at Croydon. Although a few D.H.6s were used for instruction by the Grahame-White Aviation Co. Ltd. at Hendon, by the Cambridge School of Flying and by the Bournemouth Aviation Co. Ltd., a considerable number belonged to small firms engaged on itinerant joyriding in the Midlands, Lancashire, the North Wales beaches and the Isle of Man. C. V. Maddocks and Charles Kingsford Smith, later to become the most famous of all Australian long distance pilots, acquired four D.H.6s from No. 5 (E) A.R.D., Henlow, with the intention of shipping them to Australia. After the scheme fell through they formed one of the typical mushroom firms of the period and gave pleasure flights near London taking as much as £40 in an afternoon. Among the dozen or so converted military aircraft in South Africa at the end of 1919 were two D.H.6s taken out from England by F. H. Solomon, who gave seaside pleasure flights, trading as Cape Coast Resorts Aviation Ltd. Such projects were foredoomed to failure and when the second D.H.6 crashed in 1921, all civil flying in South Africa was temporarily at an end. Three D.H.6s used by P. O. Flygkompani for joyriding in Sweden 1919–21, suffered a similar fate.

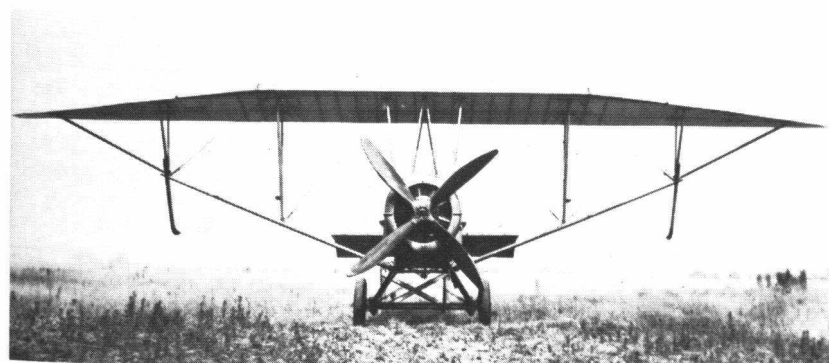
Although initially they earned a considerable amount of easy money, the post-war slump of 1920 forced most British concerns of this type out of business, but a few D.H.6s remained airworthy in the hands of pioneer private owners such as Dr. E. D. Whitehead Reid at Bekesbourne, H. B. Elwell at Lytham St. Annes and Capt. Geoffrey de Havilland whose *G-EAWD*, with wings of reduced camber, competed unsuccessfully in the Croydon Handicap Race of September 17, 1921. This machine flew for two years with the D.H. School of Flying at Stag Lane but crashed at Stanford Rivers, Essex on August 27, 1923 when a Dutch pupil lost his bearings during A Licence tests. A new and more lasting phase in the commercial life of the D.H.6 was made possible however by the Director of Research, Air Ministry, who in 1921 approved their modification to three seaters for the carriage of two fare paying passengers in tandem in the communal cockpit ahead of the pilot, at an all-up weight of 2,380 lb. The major operator was the Giro Aviation Co. Ltd. whose seven Renault and R.A.F. 1A engined machines made thousands of pleasure flights from Southport Sands in the period 1921–33. In the South the Martin Aviation Company's three D.H.6s acquired from the Brompton Motor Co. Ltd., were fitted with 80 h.p. Renault motors and did similar business from fields and beaches in the Isle of Wight during the 1921 and 1922 seasons. W. G. Chapman of the Leatherhead Motor Company also proved popular



Flotation tests with an R.A.F. 1A engined D.H.6, *A2098*, at the Isle of Grain on June 14, 1918. (*J.M.B./G.S.L. Collection.*)

at Croydon with his Curtiss OX-5 engined *G-EANU*, which was further modified to have individual cockpits. The last commercial users other than Giro were British Motor and Flying Services Ltd. at Maylands, Romford, with *G-EBPN* and *'VS'* in 1929.

A D.H.6 was modified at Sherburn-in-Elmet in 1920 by the Blackburn Aeroplane and Motor Co. Ltd. and fitted with the Alula parasol wing designed by A. A. Holle of the Commercial Aeroplane Wing Syndicate Ltd. Powered by a 200 h.p. Bentley B.R.2 rotary, it was registered *G-EAWG* and first flown by Capt. Clinch on January 2, 1921. The wing was modified in the following April with dihedral instead of anhedral and also braced to a rigid structure below the wing. After flight tests by F. T. Courtney it was dismantled and despatched to St. Cyr near Paris for completion of the tests.



The D.H.6 *G-EAWG* fitted with Alula high lift wing by the Blackburn Aeroplane and Motor Co. Ltd. in 1920. The engine was a 200 h.p. Bentley B.R.2 rotary. (*Imperial War Museum Photo HU.1820.*)

SPECIFICATION AND DATA

Manufacturers: The Aircraft Manufacturing Co. Ltd., Hendon, London, N.W.9
 The Grahame-White Aviation Co. Ltd., Hendon, London, N.W.9
 The Kingsbury Aviation Co. Ltd., Kingsbury, Middlesex
 Harland and Wolff Ltd., Belfast
 Morgan and Co., Leighton Buzzard, Beds.
 Savages Ltd., Stroud, Gloucester
 Ransome, Sims and Jefferies Ltd., Ipswich
 The Gloucestershire Aircraft Co. Ltd., Cheltenham
 Canadian Aeroplanes Ltd., Toronto, Canada
 Hispano-Suiza S.A., Guadalajara, Spain

Power Plants: One 90 h.p. R.A.F. 1A
 One 90 h.p. Curtiss OX-5
 One 80 h.p. Renault
 One 140 h.p. Hispano-Suiza

Dimensions Span 35 ft. 11 in. Length 27 ft. 3½ in. Height 10 ft. 9½ in.
 Wing area (D.H.6) 436¼ sq. ft. (D.H.6A) 413 sq. ft.

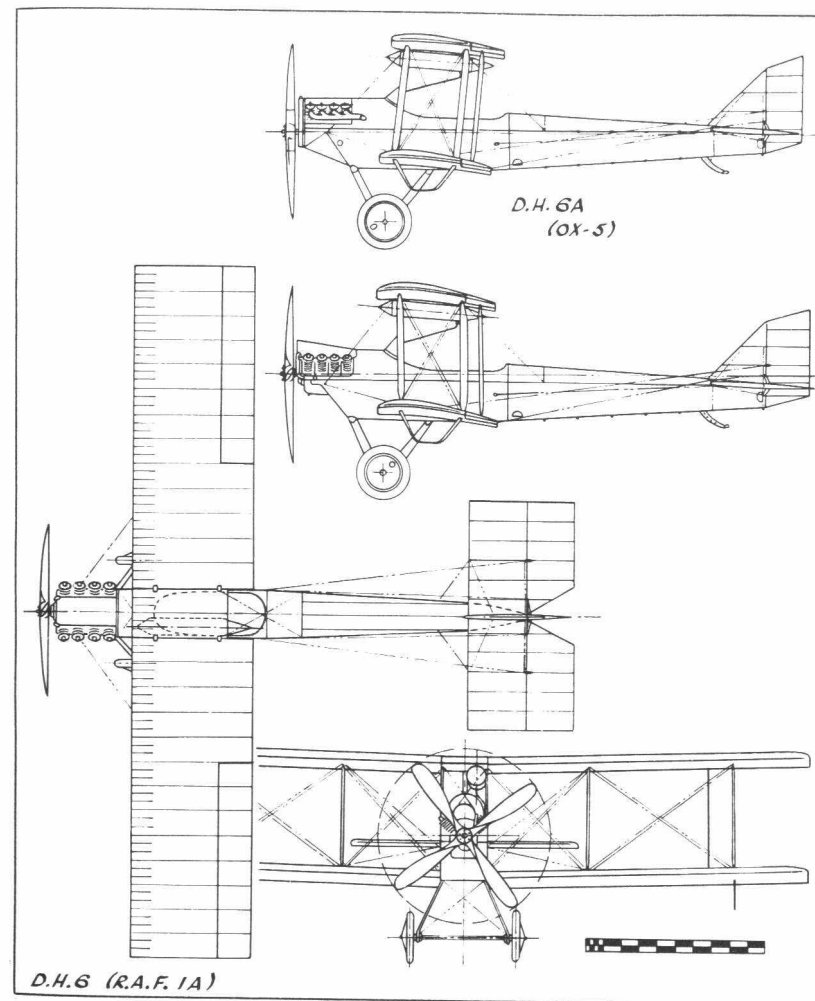
Weights and Performances:

	R.A.F. 1A		Curtiss OX-5 2 seater	Renault 3 seater
	2 seater	3 seater		
Tare weight . . .	1,460 lb.	1,670 lb.	1,539 lb.	1,360 lb.
All-up weight . . .	2,027 lb.	2,380 lb.	1,926 lb.	1,900 lb.
Maximum speed . . .	70 m.p.h.	—	75 m.p.h.	—
Stalling speed . . .	40 m.p.h.	45 m.p.h.	40 m.p.h.	40 m.p.h.
Initial climb . . .	225 ft./min.	—	185 ft./min.	—
Ceiling . . .	—	—	6,100 ft.	—
Duration . . .	2¾ hours	2¾ hours	2¾ hours	3½ hours

Production:

Serial range	Manufacturer	Serial range	Manufacturer
A5175 to A5176	Airco	C6801 to C6900	Savages
A9563 to A9762	Grahame-White	C7201 to C7600	Ransome, Sims and Jeffries
B2601 to B3100	Airco	C7601 to C7900	Grahame-White
B9031 to B9130	Airco	C9336 to C9485	Gloucestershire
C1951 to C2150	Grahame-White	D951 to D1000	Grahame-White
C5126 to C5275	Kingsbury	D8581 to D8780	Airco
C5451 to C5750	Harland and Wolff	F3346 to F3445	Airco
C6501 to C6700	Morgan		

Service Use: No. 1 Training Squadron, Stamford; No. 39 Narborough; No. 42 Hounslow; No. 44 Waddington; No. 67 Heliopolis; No. 76, 77 and 99 Home Defence; No. 110; No. 144 Port Said; 20th Training Wing, Abu Qir; Central Flying School, Point Cook, Australia. Also coastal patrols by Nos. 236, 250, 252, 254, 255, 258 and 260 Squadrons at Mullion, Padstow, Tynemouth, Prawle Point, Pembroke, Luce Bay and Westward Ho!

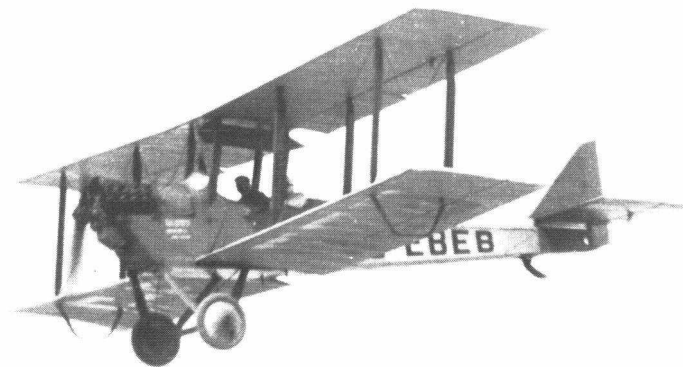


Civil Conversions: These are arranged to show by or for whom the conversion was made, former R.A.F. serial, civil registration and the fleet of the Giro Aviation Co. Ltd., the major British operator.

R.A.F. Serial and Registration United Kingdom		C. of A. Issued	Remarks
Not given	K-100	23. 7.19	Later G-EAAB; Aircraft Transport and Travel Ltd., crashed at Croydon 11.21
B2943	G-EAFT	24. 9.19	The Bournemouth Aviation Co. Ltd.
C7390	G-EAFY	Nil	Kingsford Smith Maddocks Aeros Ltd.
C7320	G-EAFZ	Nil	Kingsford Smith Maddocks Aeros Ltd.
C5224	G-EAGE	9. 9.19	The Grahame-White Aviation Co. Ltd.

<i>R.A.F. Serial and Registration</i>	<i>C. of A. Issued</i>	<i>Remarks</i>
C5220 G-EAGF*	22. 8.19	The Grahame-White Aviation Co. Ltd.
C2101 G-EAGG	Nil	The Aircraft Manufacturing Co. Ltd.
B2934 G-EAHD	2. 8.19	The Golden Eagle Aviation Co. Ltd., Squires Gate, crashed 2.20
B2917 G-EAHE	2. 8.19	The Golden Eagle Aviation Co. Ltd., Squires Gate, crashed 2.20
F3435 G-EAHH	13. 8.19	The Warwick Aviation Co. Ltd.
C6889 G-EAHI*	7. 8.19	The Warwick Aviation Co. Ltd.
C9432 G-EAHJ	Nil	H. V. David, not converted
C7390 G-EAJM	7. 8.19	Formerly G-EAFY; the Nelson Aviation Co. Ltd., crashed 8.20
Not given G-EAKU	18. 9.19	The Kingsbury Aviation Co. Ltd.
C7620 G-EALS	Nil	The Cambridge School of Flying Ltd., Hardwicke
B3094 G-EALT	29.12.19	
C9448 G-EAMK	19. 9.19	F. H. Solomon; crashed in South Africa in 1921
C9449 G-EAML	19. 9.19	
B2689 G-EAMS	Nil	J. H. T. Carr; conversion abandoned
A9613 G-EAMT	Nil	
B2861 G-EANJ*	19. 1.20	J. T. Rogers
C5230 G-EANU*	17.12.19	The Leatherhead Motor Co., Croydon
C7434 G-EAOT	31.10.19	A. B. Ford, to Switzerland 2.21 as CH-45
C7430 G-EAPG	13. 4.20	The Golden Eagle Aviation Co. Ltd.
C7739 G-EAPH	Nil	The Golden Eagle Aviation Co. Ltd.
C6503 G-EAPW	Nil	Dr. E. D. Whitehead Reid, Bekesbourne
C7815 G-EAQB	6. 7.20	By Air Ltd., Baginton
C7436 G-EAQC	29. 3.20	By Air Ltd., Baginton, written off 11.21
C2136 G-EAQQ	9. 9.22	E. Milton, written off 1.10.24
B2885 G-EAQY	29. 5.23	H. B. Elwell, Blackpool, written off 9.24
C5527 G-EARA	8. 4.20	The International Aviation Co. Ltd., Hooton
C5533 G-EARB	9. 4.20	The International Aviation Co. Ltd., Hooton
C5547 G-EARC**	1. 6.20	The International Aviation Co. Ltd., Hooton
C7768 G-EARD	8. 4.20	The International Aviation Co. Ltd., Hooton
B3061 †G-EARJ**	27. 4.20	The Golden Eagle Aviation Co. Ltd.
B3065 †G-EARK**	27. 4.20	The Golden Eagle Aviation Co. Ltd.
B3003 †G-EARL	27. 4.20	The Golden Eagle Aviation Co. Ltd.
B3068 †G-EARM**	12. 4.20	The Golden Eagle Aviation Co. Ltd.
B3067 G-EARR	1. 6.20	A. Patchett, Lincoln
Not given G-EATI	10. 6.20	C. B. Wilson, Manchester
C7763 †G-EAUS	9. 7.21	Blackpool Flying Services Ltd.
C9436 G-EAUT	20. 5.21	Blackpool Flying Services Ltd.
Not given G-EAVG	Nil	The Giro Aviation Co. Ltd., Southport
C7797 G-EAVR	15. 1.21	Humphrey's Film Productions Ltd.
649 (sic) G-EAWD	21. 6.22	The de Havilland Aircraft Co. Ltd.
F3437 †G-EAWT	23. 5.21	The Brompton Motor Co. Ltd.; flown in the Isle of Wight by the Martin Aviation Co. Ltd.
F3439 †G-EAWU	23. 5.21	
F3440 †G-EAWV	23. 5.21	
Nil G-EBEB	17. 4.24	The Giro Aviation Co. Ltd., "Maysbus"
C7823 G-EBPN	7. 7.27	F. J. V. Holmes, Witney; scrapped 12.30
F3443 G-EBVS	27. 4.28	British Flying and Motor Services Ltd., Maylands; scrapped 12.30
C7291 G-EBWG**	9. 3.28	R. J. Bunning, dismantled at Southport 1935
Not given G-AARN	Nil	V. N. Dickinson, St. Albans, scrapped 1933

† Renault engine. * Curtiss OX-5 engine. ** Later sold to the Giro Aviation Co. Ltd.



The well-known D.H.6 "Maysbus" G-EBEB of the Giro Aviation Co. Ltd. flying over Southport Sands. (Photo courtesy of John Cope.)



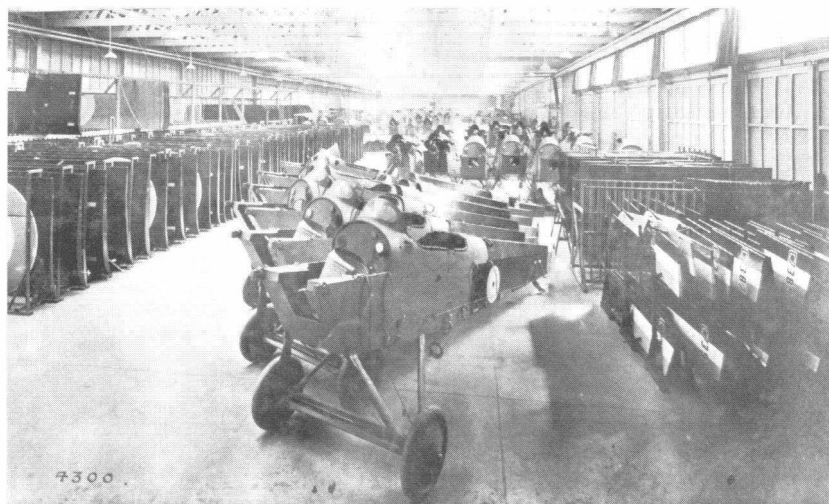
C. D. Pratt stripping down the R.A.F.1A engine of his first joyriding D.H.6, G-AUDO, in the Australian outback in the 1920s. (C. D. Pratt Collection-AHSA Vic.-CDP.22.)



A typical joyriding team with ground engineer, pilot (Capt. Martin) and ticket salesman at Cleethorpes in 1923 alongside the Martin Aviation Company's D.H.6, G-EAWT. (Courtesy of P. H. T. Green.)

<i>R.A.F. Serial and Registration</i>	<i>C. of A. Issued</i>	<i>Remarks</i>	
Australia			
<i>Not given G-AUBH</i>	28. 6.21	c/n given as 3204, W. Robinson, Grafton, N.S.W., struck off register 27.6.22	
<i>Not given G-AUBO</i>	28. 6.21	c/n given as 642, F. T. O'Dea, Bathurst, N.S.W., crashed at Maroochydore, Q., 27.1.27	
<i>C9374 G-AUBW</i>	28. 6.21	Flying in 1928 with the Shaw Ross Engineering and Aviation Co. Ltd., burned in hangar fire, Melbourne, 7.8.31	
<i>Not given G-AUDS</i>	27. 7.22	c/n given as 3858, J. Linn, Orange, N.S.W., crashed at Orange, 29.4.25	
<i>Not given G-AUDW</i>	29. 3.23	c/n given as 3202, Air Transport Ltd., Perth, W.A., crashed 19.11.23	
<i>C7625 G-AUEA</i>	1. 6.23	Erected from spares by C. D. Pratt, c/n 2, crashed at Mooroonpa, V., 25.10.30	
<i>C1972 G-AUDO</i>	28.12.21	C. D. Pratt, Geelong, V., struck off register 29.9.28	
Belgium			
<i>F3368 O-BAQQ</i>	—	Registered in 1924, scrapped 11.24	
Canada			
<i>C5221 —</i>	—	Shipped to Montreal 1919 for C. P. Moffett	
<i>F3434 —</i>	—	Shipped to Brandford, Ontario 1919 for H. Cockshutt, c/o Cockshutt Plow Co.	
Spain			
<i>Not given M-AAAB</i>	—	Hispano-Britannica S.A., Madrid 2.20	Hispano engines
<i>Not given M-AAEE</i>	—	Registered 2.21	
United States			
<i>Not given N-XAAA</i>	—	Registered in 1922	

Note: Fitted with R.A.F. 1A engine unless otherwise stated.



D.H.6 aircraft under construction by Ransomes, Sims and Jefferies Ltd. at their Orwell Works, Ipswich, in 1917. (Courtesy Ransomes, Sims and Jefferies Ltd.)



A standard G. & J. Weir-built D.H.9 with 230 h.p. Siddeley Puma engine, at Renfrew in 1918 named "Georgetown" and inscribed 'Presented by the Munition Workers of the Scottish Filling Factory'.

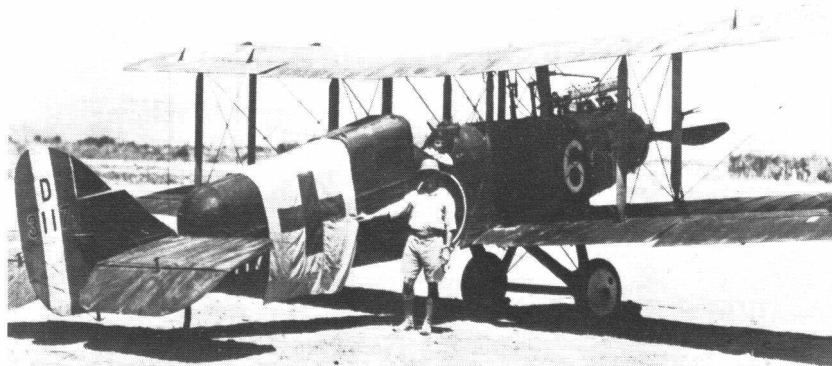
De Havilland D.H.9

By the summer of 1917 the need had become apparent for a fast bomber capable of carrying heavier loads over greater distances than the D.H.4. Reluctant to abandon altogether the manufacturing facilities developed for this successful and well proven type, the Air Board finally sanctioned the large scale production of a version so drastically modified that it was necessary to give it the new type number D.H.9. Structurally similar to its predecessor, the D.H.9 used identical mainplanes and tail surfaces but the pilot no longer sat in jeopardy between engine and fuel tanks, but next to, and in communication with, the gunner. The nose was of a better streamlined shape and the engine installation resembled that of the Fiat engined D.H.4, but with the added refinement of a radiator retracting into the underside of the front fuselage as a means of temperature control. The prototype was a D.H.4 numbered 47559, converted by the Aircraft Manufacturing Co. Ltd. and fitted with a 230 h.p. Galloway-built B.H.P. engine sometimes known as the Adriatic. Flight trials commenced at Hendon in July 1917 and contracts already awarded to sub-contractors were amended so that D.H.9s rolled from the production lines instead of D.H.4s.

Production machines, ultimately turned out at the rate of one every 40 minutes, were fitted initially with the Siddeley-built B.H.P. engine but the majority had the Siddeley Puma, a lightweight version of the B.H.P. modified for mass production by the Siddeley-Deasy Car Company. Teething troubles proved so serious that the Puma, although expected to deliver 300 h.p., had to be derated to 230 h.p., with the result that the D.H.9 was underpowered and consequently inferior in performance to the aircraft it was to replace. With full military load comprising 70 gallons of fuel, 4½ gallons of oil, 6½ gallons of water, one pilot's forward firing

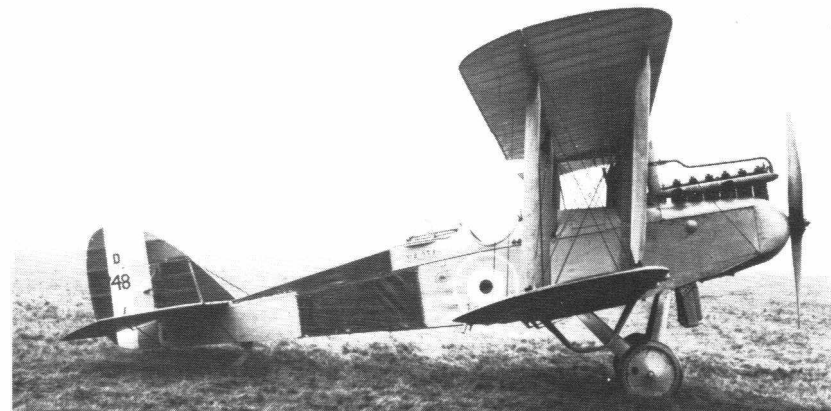
Vickers gun operated by Constantinesco interruptor gear, observer's Lewis gun, two 230 lb. or four 112 lb. bombs, it was unable to climb above 13,000 ft. Deliveries commenced with a batch of five at the end of 1917 and the type was in service with squadrons in France by April 1918. Inevitably serious losses were incurred such as on July 31, 1918 when only two out of twelve D.H.9s returned from a raid on Germany. The prevalence of engine trouble put an additional and intolerable burden on aircrews, and Nos. 99 and 104 Squadrons alone suffered 123 engine failures out of 848 sorties flown before the Armistice. The D.H.4 was therefore retained in service and the D.H.9 supplemented rather than superseded it. In less hotly contested areas, the D.H.9 enjoyed greater success, notably in September 1918 against the Turks in Palestine. Long range reconnaissance flights of over 300 miles were made against the Bulgars from bases in Macedonia, and ranges of over 400 miles were achieved by D.H.9s locally modified in the Aegean Islands to carry overload fuel tanks for the bombing of Constantinople.

At home the D.H.9 joined D.H.4s on coastal defence and anti-Zeppelin work, and at the end of the war replaced some of the D.H.6s on anti-submarine patrols. Thereafter the D.H.9 was relegated to non-combatant roles and on December 17, 1918 those of No. 99 Squadron, operating with D.H.4s of Nos. 55 and 57 Squadrons, inaugurated the first cross-Channel air mail service. Twenty five bags of mail for the Army of Occupation on the Rhine were flown to Valenciennes in bad weather, en route to Cologne. These squadrons made 917 sorties during the winter out of a possible 1,017. By July 1919 no D.H.9s remained on R.A.F. charge, the last examples in service being the ambulance versions operating with 'Z Force' in Somaliland. These, exemplified by *D3117*, carried one stretcher case in a coffin-like enclosure on top of the rear fuselage and had the upper trailing edge cut-out filled in.

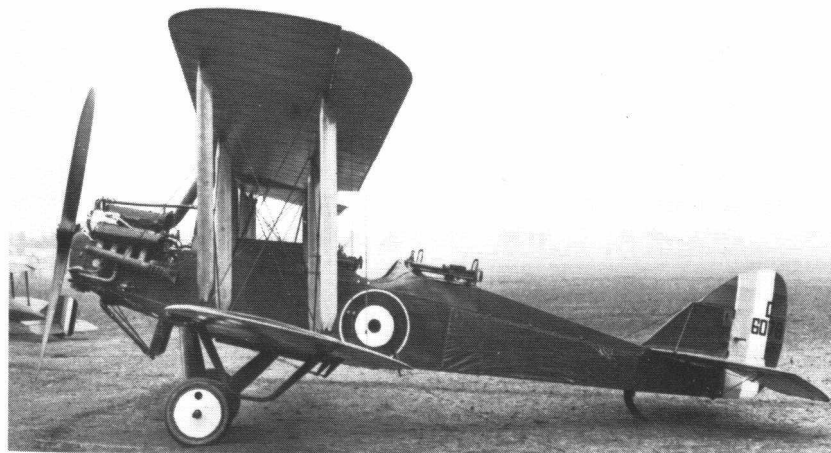


Modified to carry one stretcher case on top of the rear fuselage, *D3117* was one of the D.H.9 ambulances used in Somaliland in 1919. (Imperial War Museum Photo Q.69262.)

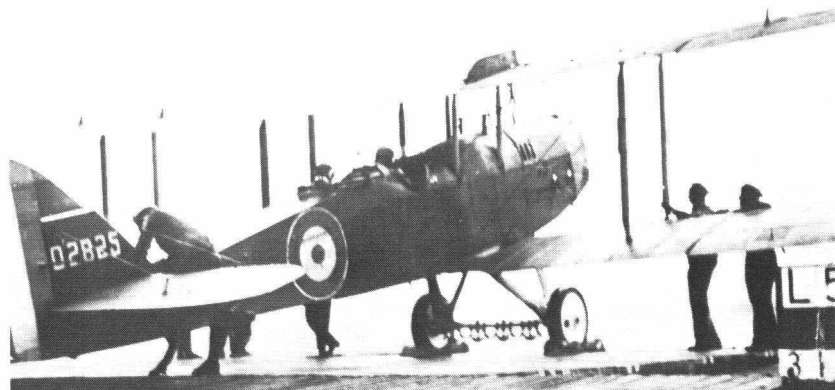
Although the D.H.9 was not a success in its intended role and faded ignominiously from the R.A.F. after suffering rapid replacement by the D.H.9A, its career was by no means over. Many interesting modifications were made to it and after the experimental installation of 250 h.p. Fiat A-12 engines in D.H.9s *C6052* and *D5748*, a batch of one hundred commencing *D2776* was ordered from Short Brothers. As the engine closely resembled the Puma externally the main distinguishing feature was the exhaust manifold, fitted to the starboard side on Fiats and to the port side on Pumas, but in addition the radiator was fixed and equipped with



D5748, a D.H.9 built by Waring and Gillow. The engine was a 250 h.p. Fiat A-12, recognised by the starboard mounted exhaust manifold. (Imperial War Museum Photo MH.3532.)



D.H.9 serial *C6078* at Farnborough in 1918 equipped as the flying testbed for the prototype Napier Lion engine with heated carburettor. (Imperial War Museum Photo MH.3515.)



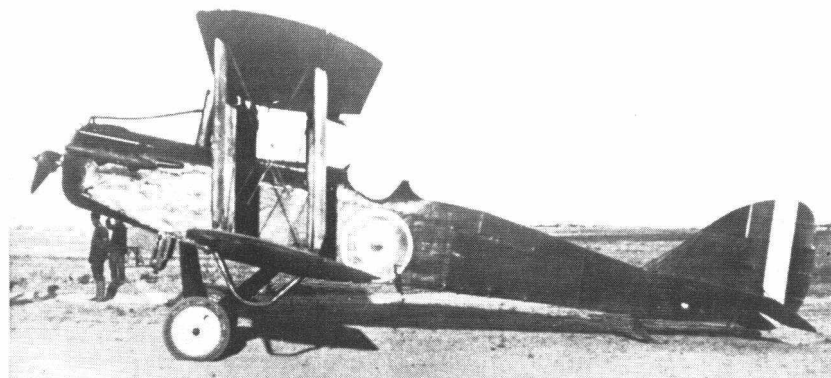
A Short-built D.H.9 D2825 with Siddeley Puma engine, modified with D.H.4-type nose radiator for deck flying trials on H.M.S. *Eagle* in 1921.

vertical shutters because of the greater length of the Fiat installation. Some of this batch were later converted to Pumas for deck landing trials on H.M. Aircraft Carrier *Eagle* in 1921, and were fitted with D.H.4 type front radiators instead of the underslung type, to minimise damage if forced to ditch.

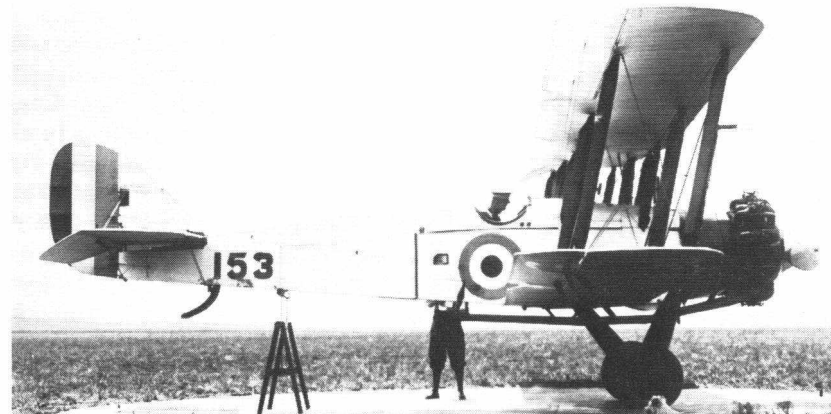
In February 1918 one of the prototype Napier Lion, broad arrow, 12 cylinder, watercooled engines was experimentally fitted at Farnborough to the D.H.9 C6078 and first flown on March 16th. The same machine was later fitted with a developed Lion engine and flown, on October 20th, to Martlesham where on January 2, 1919 Capt. Andrew Lang flew it to 30,500 ft. and established a World's altitude record. Throughout 1919 the R.A.E. experimented with an R.H.A. supercharger fitted to E630 and with alternative radiator positions on D2825.

The success of the Liberty engined D.H.4 prompted the American Expeditionary Force to install the improved 435 h.p. Liberty 12A engine in the D.H.9 and two airframes, one of which was C6058, were acquired for this purpose in July 1918.

After the war surplus D.H.9s took on a new lease of life in the service of other nations, mainly because their low initial cost was counted above military invincibility. Eighteen were supplied to Belgium, 12 to Poland, 48 to South Africa as part of the Imperial Gift, 9 to New Zealand, 28 to Australia and others to Canada, India, Afghanistan, Greece, the Irish Free State, Holland and Latvia. One of the 20 Puma engined D.H.9s supplied to Chile was flown by the Director of Civil Aviation, Capt. Aracena, 1,850 miles from Santiago to Rio de Janeiro in the autumn of 1922 and in the same year D.H.9s 16 and 17 (ex H9133) of the Estonian Air Squadron, made the long flight from Tallinn to Riga. Earlier, in January 1920, the D.H.9 30 (ex D660) crashed at Tallinn at the end of an historic flight from Helsinki with the first load of bank notes for the newly created Estonian Republic. Those of the South African Air Force gave sterling



The so-called D.H. Mantis, a South African Air Force D.H.9 fitted at Roberts Heights with the 200 h.p. Wolseley Viper engine taken from an S.E.5A.



One of the Bristol Jupiter VI engined South African Air Force M'pala I general purpose aircraft. (Bristol Photo.)



A D.H.9 of the Netherlands Army Air Service, fitted in 1934 with a 465 h.p. Wright Whirlwind R-975 radial.

service for many years, and at least one, 159, was fitted with a 200 h.p. Wolseley Viper and unofficially named the D.H. Mantis. Six saw active service during the Boudelzartz rebellion in 1922 and two piloted by Capt. C. J. Venter D.F.C. and H. C. Daniel M.C., D.F.C., which flew 1,000 miles from Pretoria to Cape Town in 9 hours 45 minutes on March 5, 1924, were the first aircraft to make the journey in the daylight hours of one day. Others, e.g. 101, were used in 1925 on an experimental air mail service between Cape Town and Durban, 450 lb. of payload being carried on each trip. In the following year comparative trials took place at Roberts Heights between D.H.9s fitted with the A.D.C. Nimbus, Armstrong Siddeley Jaguar and Bristol Jupiter engines. Final choice fell on the Jupiter and a number of S.A.A.F. D.H.9s, rebuilt as the D.H.9J M'pala I general purpose type with Jupiter VI or as the M'pala II for communications with Jupiter VIII and divided axle wide track oleo undercarriage, survived until 1937. The designation D.H.9J was also used for the Jaguar engined conversions made at Stag Lane (see page 136), a form of ambiguity also practised with D.H.50 variants.

The Puma D.H.9 made a most important contribution to aerodynamic research when, in 1920, Mr. (later Sir Frederick) Handley Page equipped a standard aircraft, H9140, with his newly invented leading edge slots. These were full span, auxiliary aerofoils permanently fixed along both mainplanes to give maximum lift, thereby increasing the wing area by 34 sq. ft. Later a taller undercarriage was fitted and in September 1920 comparative trials took place at Farnborough against a standard D.H.9 D5755. These showed a reduction in stalling speed from 51 to 44½ m.p.h. and at a public demonstration at Cricklewood on October 21, 1921 Maj. E. L. Foot took full advantage of the ground angle imparted by the tall

undercarriage by taking off in a three point attitude and going straight into a sensational angle of climb. The performance of this H.P.17 led to an order for the H.P.19 Hanley, similarly equipped.

Following Maj. Hereward de Havilland's tour through Spain in a Lion engined D.H.9 in 1919, a number of war surplus D.H.9 airframes were sold to the Spanish Government. These were erected by the Hispano-Suiza company and fitted with 300 h.p. Hispano-Suize 8Fb engines. From 1925 Hispano built the type under licence and a total production in excess of 500 has been quoted. They were used in the African squadrons for reconnaissance and also at the Advanced Training School at Guadalajara. At the outbreak of the Civil War 25 were still in service in Spain, of which 21 went over to the Reds, and at least one, 34-18, was still active in 1940.

D.H.9s equipping the Netherlands Army Air Service were unique, not only because they included 10 built at Stag Lane in 1922 from unused components and others impressed after they forced landed on neutral Dutch territory during the First World War, but because many were rejuvenated as late as 1934 with Wright Whirlwind radial engines. Similar treatment was also applied to 13 modified D.H.9s which were built by the Netherlands East Indies Army workshops in 1926. These had plywood fuselages, revised ailerons, enlarged fin and rudder, large D.H.50-type nose radiators and extended exhaust pipes. Several Dutch machines were converted for the photo-reconnaissance role and others, equipped as ambulances, closely resembled those used in Somaliland in 1919.

A demand for surplus D.H.9s, reconditioned at Croydon by the Aircraft Disposal Co. Ltd. continued until 1924, but so great was their original stock that large numbers of unsold machines remained dismantled and neglected until burned in 1931. One D.H.9, in Independent Air Force colours, numbered F1258 survives in the French Musée de l'Air and is currently (1987) housed at Le Bourget. Another is displayed at the South African National War Museum near Johannesburg.

SPECIFICATION AND DATA

Manufacturers: The Aircraft Manufacturing Co. Ltd., Hendon, London, N.W.9
The Alliance Aeroplane Co. Ltd., Cambridge Rd, Hammersmith, London, W.6
F. W. Berwick and Co. Ltd., Park Royal, London, N.W.10
Cubitt Ltd., Croydon, Surrey
Mann, Egerton and Co. Ltd., Aylsham Road, Norwich, Norfolk
National Aircraft Factory No. 1, Waddon, Surrey
National Aircraft Factory No. 2, Heaton Chapel, near Stockport, Lancs.
Netherlands East Indies Army Workshops, Andir, Java.
Short Bros. (Rochester and Bedford) Ltd., Rochester, Kent
The Vulcan Engineering and Motor Co. (1906) Ltd., Crossens, Lancs.
Waring and Gillow Ltd., Cambridge Road, Hammersmith, London, W.6
G. & J. Weir Ltd., Cathcart, Glasgow
Westland Aircraft Works, Yeovil, Somerset
Whitehead Aircraft Co. Ltd., Townshend Road, Richmond, Surrey
SABCA, Haren Airport, Brussels, Belgium
Hispano-Suiza S.A., Guadalajara, Spain



Maj. E. L. Foot in the H.P.17 slotted research biplane at Cricklewood during the demonstrations of October 21, 1921. Formerly a standard D.H.9 H9140, it was flown against the unmodified sister aircraft G-EAUN seen in the background. ('Flight' Photo 974.)

Power Plants: One 230 h.p. B.H.P. (Galloway Adriatic)
 One 230 h.p. Siddeley Puma
 One 290 h.p. Siddeley Puma high compression
 One 250 h.p. Fiat A-12
 One 300 h.p. A.D.C. Nimbus
 One 300 h.p. Hispano-Suiza 8Fb
 One 430 h.p. Napier Lion
 One 435 h.p. Liberty 12A
 One 465 h.p. Wright Whirlwind R-975
 (Mantis) One 200 h.p. Wolseley Viper
 (M'pala I) One 450 h.p. Bristol Jupiter VI
 (M'pala II) One 480 h.p. Bristol Jupiter VIII

Dimensions, Weights and Performances (without bomb load):

	Puma	Fiat	Lion	Liberty
Span . . .	42 ft. 4 $\frac{3}{8}$ in.	42 ft. 4 $\frac{5}{8}$ in.	42 ft. 4 $\frac{5}{8}$ in.	42 ft. 4 $\frac{3}{8}$ in.
Length . . .	30 ft. 5 in.	30 ft. 0 in.	30 ft. 9 $\frac{1}{2}$ in.	30 ft. 0 in.
Height . . .	11 ft. 3 $\frac{1}{2}$ in.	11 ft. 2 in.	11 ft. 7 $\frac{3}{4}$ in.	11 ft. 2 in.
Wing area . . .	434 sq. ft.	434 sq. ft.	434 sq. ft.	434 sq. ft.
Tare weight . . .	2,230 lb.	2,460 lb.	2,544 lb.	—
All-up weight . . .	3,325 lb.	3,600 lb.	3,667 lb.	4,645 lb.
Maximum speed . . .	109.5 m.p.h.*	117.5 m.p.h.*	138 m.p.h.*	114 m.p.h.**
Initial climb . . .	625 ft./min.	725 ft./min.	1,600 ft./min.	—
Service ceiling . . .	15,500 ft.	17,500 ft.	23,000 ft.	—
Endurance . . .	4 $\frac{1}{2}$ hours	—	3 $\frac{1}{2}$ hours	—

* At 10,000 ft.

** At ground level.

British Production:

Serial range	Manufacturer	Serial range	Manufacturer
B7581 to B7680	Westland	D7301 to D7400	Berwick
B9331 to B9430	Vulcan	*D9800 to D9899	G. & J. Weir
C1151 to C1450	G. & J. Weir	E601 to E700	Whitehead
C2151 to C2230	Berwick	E5435 to E5436	Airco
C6051 to C6350	Airco	E8857 to E9056	Airco
*D451 to D950	Cubitt	*F1 to F300	N.A.F. No. 1
*D1001 to D1500	N.A.F. No. 2	F1101 to F1300	Waring & Gillow
D1651 to D1750	Mann, Egerton	*F1767 to F1866	Westland
D2776 to D2875	Short Bros.	**H4216 to H4315	Airco
D2876 to D3275	Airco	H5541 to H5890	Alliance
D5551 to D5850	Waring & Gillow	†H7913 to H8112	G. & J. Weir
D7201 to D7300	Westland	H9113 to H9412	Airco

* Not all completed.

** Majority completed as D.H.9As.

† Order cancelled.

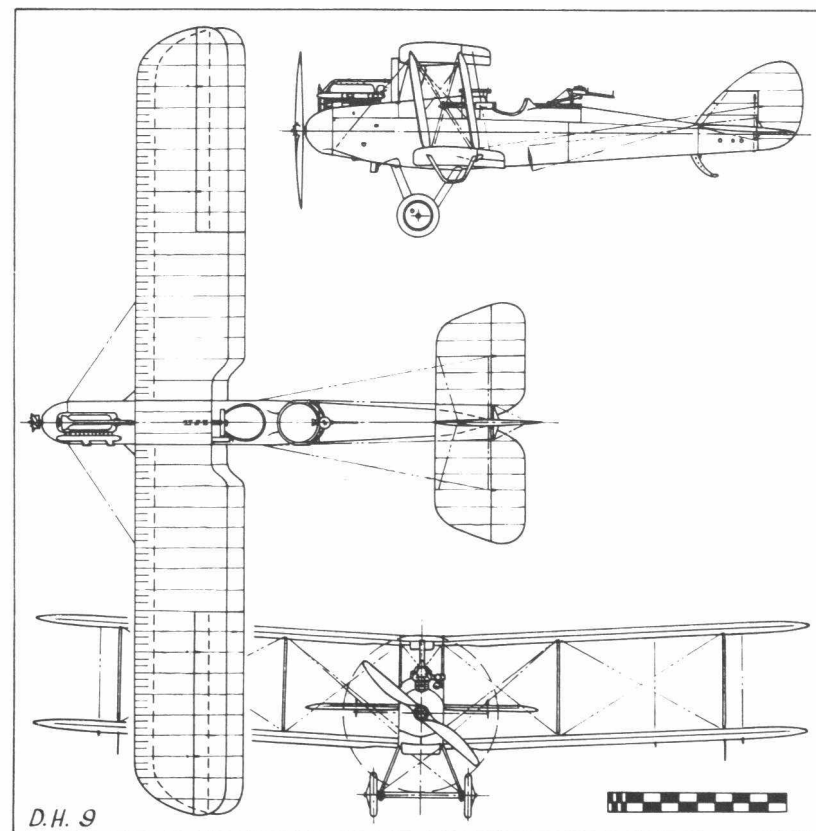
Service Use: (a) On the Western Front with Nos. 18, 27, 49, 55, 98, 99, 103, 104, 107, 108, 110, 120, 202, 206, 211 and 218 Squadrons, R.A.F. (b) Coastal patrols by Nos. 212, 236, 250 and 273 Squadrons at Dover, Great Yarmouth, Mullion, Padstow and Burgh Castle. (c) Coastal patrols by No. 229 Squadron at Oudezeele, Belgium. (d) In Palestine with No. 144 Squadron and Macedonia with Nos. 17 and 47 Squadrons. (e) In the Mediterranean with Nos. 224, 225, 226 and 227 Squadrons. (f) In the Aegean with Nos. 220, 221, 222, 223

and 269 Squadrons. (g) In Russia with Nos. 47 and 221 Squadrons. (h) As a trainer at the Air Observers' Schools at Eastchurch, Manston and New Romney; the School of Reconnaissance at Farnborough; Schools of Navigation and Bombing at Stonehenge, Andover and Thetford; No. 10 Training Squadron, Harling Road and No. 31 Training Squadron, Wyton; also at Cranwell and Shoreham. (i) With the Belgian Air Force and United States Expeditionary Force.

Postwar Production by the de Havilland Aircraft Co. Ltd. for the Netherlands Army Air Service:

Constructor's Number	Dutch serial	Packed for shipment	Constructor's Number	Dutch serial	Packed for shipment
56	476	10.1.23	61	481	8.1.23
57	477	17.1.23	62	478	9.1.23
58	482	17.1.23	63	483	9.1.23
59	479	6.1.23	64	484	10.1.23
60	480	8.1.23	65	485	10.1.23

Assembled at Soesterberg.



(a) To the Belgian Air Force in temporary civil markings December 1921 to May 1922.

H5619 . G-EAYW	H5666 . G-EAZJ	H5851 . G-EBAB	H5662 . G-EBAS
H5833 . G-EAYY	H5865 . G-EAZM	H5621 . G-EBAD	H5735 . G-EBBA
H5448 . G-EAYZ	H5707 . G-EAZN	H5736 . G-EBAE	H5709 . G-EBBB
H5629 . G-EAZA	H5845 . G-EAZO	H5712 . G-EBAI	H5711 . G-EBBJ
H5705 . G-EAZB	H5868 . G-EAZP	H5716 . G-EBAO	H5719 . G-EBBK
H5607 . G-EAZC	H5706 . G-EAZY	H5741 . G-EBAP	H5836 . G-EBCH
H5856 . G-EAZD	H5668 . G-EAZZ	H5753 . G-EBAQ	H5742 . G-EBCI
H5757 . G-EAZE	H5783 . G-EBAA	H5747 . G-EBAR	H5820 . G-EBCJ

Other airframes: F1140, F1201, F1204, F1227, F1228, F1229, F1275, H5765.

Note: The Belgian Air Force received 130 D.H.9s, including the above and 30 built by SABCA at Brussels (last delivery March 1923).

(b) Replacement aircraft to various destinations 1922

H5775 . G-EBEF	D5777 . G-EBEH	F1216 . G-EBEJ
D1347 . G-EBEG	F1286 . G-EBEI	—

(c) Shipped abroad with British civil Certificates of Airworthiness.

Dated 1.7.24		Dated 10.7.24	
H5855	H9302	H9242	H9283
H5864	H9309	H9250	H9285
H5880	H9313	H9252	H9297
H9260	H9341	H9275	H9311
H9298	H9370	H9278	H9330

(d) Quantities supplied to the Netherlands East Indies Army Air Service.

31.5.19 twelve 9.3.21 six 11.4.21 eight 8.9.22 ten
Serial range: H-101 to H-136

Aircraft built at the Netherlands East Indies Army (KNIL) workshops 1926

Prototype, serial HL-137, followed by production batch serialised HL-138 to HL-149.



A tropicalised D.H.9A target tug J7307, c/n 124, with extra radiator, Handley Page slots, spare wheel and other 'refinements', flying over Iraq in 1927. (Imperial War Museum Photo H(AM)823.)

De Havilland D.H.9A

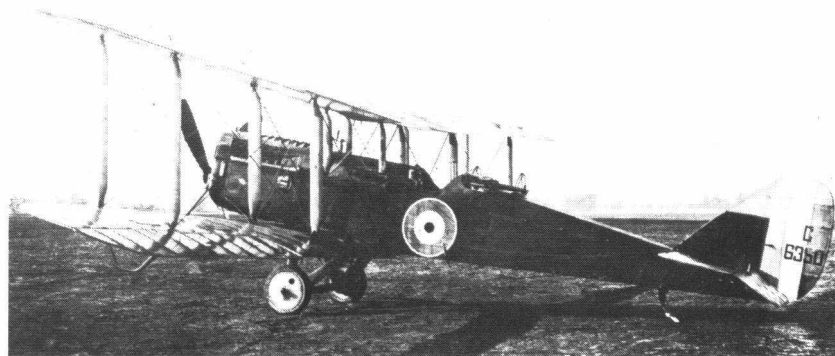
By the end of 1917 the demand for Rolls-Royce Eagle VIII engines exceeded the supply to such an extent that orders were placed in America for large numbers of 400 h.p. Liberty 12s. These were earmarked for a new day bomber based on the D.H.9 but the Aircraft Manufacturing Co. Ltd., was at that time engaged on building the D.H.10 so that the extensive re-design of the earlier type was entrusted to the Westland Aircraft Works at Yeovil, Somerset. Assisted by Mr. John Johnson, specially loaned for the purpose by Airco, the Westland design team, already experienced in building the D.H.4 and D.H.9, not only took full advantage of the extra power of the Liberty but also combined the best features of both these designs to create the outstanding strategic bombing aeroplane of the War. The fuselage was strengthened to take the heavier engine mainly by replacing the plywood partitions of the D.H.9 by wire cross bracing, while an improvement in climb and ceiling was ensured by fitting mainplanes of increased span and chord.

The new machine was designated D.H.9A, the prototype of which was a modified Westland built D.H.9, B7664, fitted with a Rolls-Royce Eagle VIII to enable flight trials to proceed while awaiting delivery of the Liberty engines. A second Eagle powered example, C6350, was also used, this being a Hendon built D.H.9 converted by Airco. Representatives of the Packard Motor Company, manufacturers of the Liberty, came to England to supervise its installation in production D.H.9As, the first of which was C6122 and by December 1918, 885 had been built by Westland and other contractors. Armament consisted of one forward firing Vickers gun on the

port side of the front fuselage, single or double Lewis guns on a Scarff ring on the rear cockpit and up to 660 lb. of bombs carried on external racks under the fuselage and lower mainplanes.

Many D.H.9As were flight tested at Yeovil by Harry Hawker and the first squadron arrived in France on August 31, 1918. This was No. 110 which flew aircraft presented by the Nizam of Hyderabad, carried inscriptions to that effect and dropped some 10½ tons of bombs in daylight raids on Coblenz, Frankfurt, Mannheim and other German industrial centres. The D.H.9A also formed the new equipment of several other squadrons on the Western Front and of Nos. 47 and 221 Squadrons which fought the Bolsheviks in Russia, where replicas were later built as the type R-1 powered by the M-5, an engine of local manufacture copied from the Liberty.

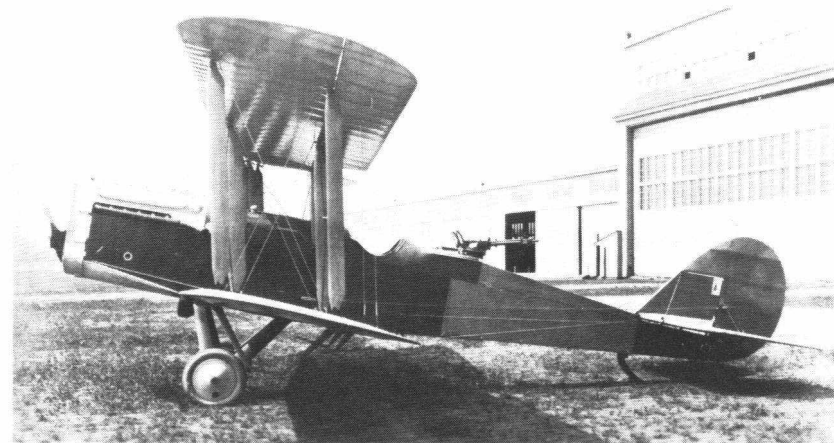
As in the case of the D.H.9, two Airco-built D.H.9As (one being E8449) were sent to America where it was planned to build 4,000. The Armistice terminated this project but four prototypes were built, two by the Engineering Division of the Army's Bureau of Aircraft Production and two by Dayton-Wright. Completed in August 1918, they were designated USD-9 but their dimensions alone show that they were copies of the D.H.9A and not of the D.H.9. In October 1918 Dayton-Wright delivered four examples of a modified version known as the USD-9A which had the pilot's Browning gun on the starboard side and was fitted with a more rounded rudder. In the following month five more USD-9As were produced by the Engineering Division which in February 1919 converted one of them to USD-9B with 435 h.p. Liberty 12A and wings of increased area. Another of these aircraft, serial A.S.40118, was a single seater experimentally fitted with a pilot's compartment of riveted steel plates and is believed to be the first machine ever to fly with a pressurised cockpit. The conversion was made at McCook Field, Dayton, Ohio in 1920 by the Engineering Division and was first flown by 'Art' Smith, a



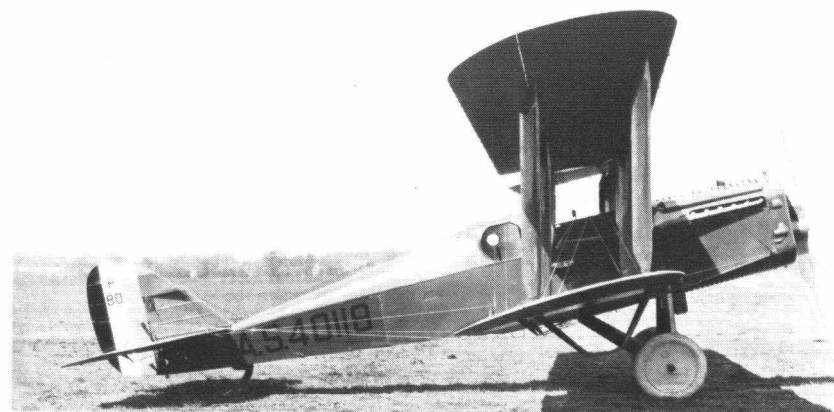
The second prototype D.H.9A, C6350, was a D.H.9 rebuilt at Hendon by the Aircraft Manufacturing Co. Ltd.

civilian test pilot, on June 8, 1921. Pressurisation was effected by a propeller driven pump on the port lower mainplane and the instrument panel was positioned on the trailing edge on the top centre section. The career of the USD-9A ended in 1922 when two examples appeared as the Ordnance IL-1 infantry liaison type at an all-up weight of 5,686 lb. It was of grotesque appearance having triple instead of double interplane and undercarriage struts.

After the war the D.H.9A continued in production in the United Kingdom and several hundred were built for Regular and Auxiliary day bomber squadrons at home, for Flying Training Schools and for squadrons stationed in the Near and Middle East. From June 23, 1921, D.H.9As of

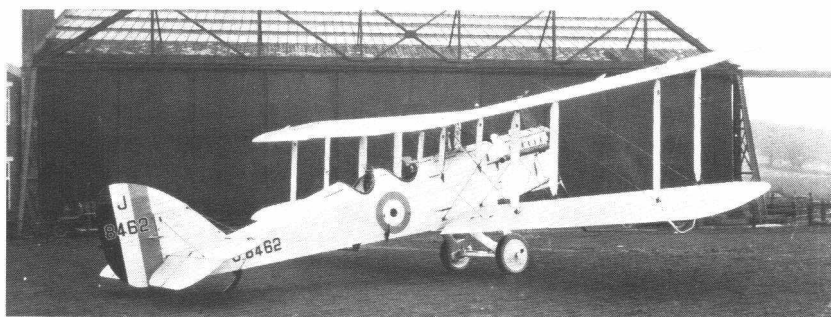


One of the USD-9As built in America in 1918 by the Engineering Division of the Army's Bureau of Aircraft Production, showing the rounded rudder.



The single seat pressure cabin USD-9A serial A.S.40118 (project number P80).

Nos. 30 and 47 Squadrons were used on the regular Cairo–Baghdad mail service. Long term contracts were placed with Westland and de Havilland under Specification 45/22 for reconditioning D.H.9As, and the type remained standard equipment for 13 years, until struck off charge in 1931. During that time it formed the initial equipment of the newly formed Auxiliary Squadrons and under the nickname ‘Ninak’ became familiar to the man-in-the-street for its inspiring displays of wing drill at Hendon Pageants and its battle formations during the ‘Redland’ versus ‘Blueland’ manoeuvres staged annually by the R.A.F. in those days.



A late production Liberty engined D.H.9A converted to dual trainer by the Westland Aircraft Works at Yeovil in 1928. (*Westland Photo.*)

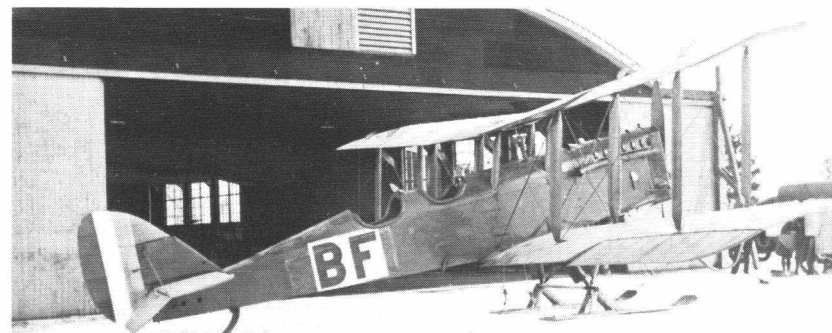
In Iraq and on the North West Frontier the tropicalised D.H.9A became a general purpose aircraft equipped with an additional radiator under the nose and an overload fuel tank under the starboard upper mainplane. It was engaged mainly on policing duties and when working over difficult terrain, far from regular lines of communication, often carried spare wheels, goatskins of water, or tents and bedding on the sides of the fuselage or between the undercarriage struts. One aircraft, placed at the disposal of the Portuguese long distance pilot Major Brito Paia to replace his wrecked Breguet, left Lahore on May 30, 1924 fitted as a three seater en route to Macao, but crashed near Hongkong on June 20th. Between October 27, 1925 and November 1st, three others flew from Cairo to Kano, Nigeria, piloted by Sqn. Ldr. Coningham, and F/Lts. Baggs and Rowley. Some D.H.9As were converted for target towing or as dual trainers, and in 1929 J8177 became the personal aircraft of A.V.M. Sir Robert Brooke-Popham, A.O.C. Iraq.

Australia and Canada received the type in 1920 as part of the Imperial Gift, but most of the 29 sent to Australia remained crated until commissioned by the Royal Australian Air Force under the type serial A1 in 1925. After modification by the Whitehead Aviation Company, all 11 Canadian D.H.9As were handed over to the Air Board Civil Operations Branch for forestry patrol and survey work alongside the D.H.4s. Between October 11–17, 1920 three of them took part in the first trans-Canada flight, each covering one leg of the Winnipeg–Vancouver section, piloted

respectively by F/Lts. J. B. Home-Hay, C. W. Cudemore (*G-CYAJ*) and G. Thompson (*G-CYBF*). In 1922 six were at Camp Borden and the remainder were on photographic survey work on wheel or ski undercarriages at Rockcliffe, but the majority were destroyed in a hangar fire at Camp Borden on October 16, 1923.



G-CYAJ, the Canadian Air Board D.H.9A in which F/Lt. C. W. Cudemore flew the Regina–Medicine Hat section of the first trans-Canada air mail on October 11, 1920. (*R.C.A.F. Photo.*)



The D.H.9A *G-CYBF* on skis at R.C.A.F. Camp Borden in February 1927. (*J. F. McNulty Photo.*)

Successful development of the 450 h.p. Napier Lion engine, first flown in 1918 in a D.H.9, led to a prototype, *E775*, and ten production installations, *E746*, *E748–50*, *E752–57*, being made in new Whitehead-built D.H.9A airframes by the R.A.E., at Farnborough. Although of broad arrow configuration, the Lion fitted snugly into close fitting cowlings and was cooled by an underslung retractable radiator designed and constructed at the R.A.E., which also made the airscrew. After prototype trials with *E775* in April 1919, the first production aircraft, actually *E748*, was completed with large mail boxes under the lower mainplane and first flown on July 18th. The boxes were fitted to several others but were subsequently removed and the rear cockpits enlarged for the internal stowage of mail bags. *E775* was also tested in September 1919 with a

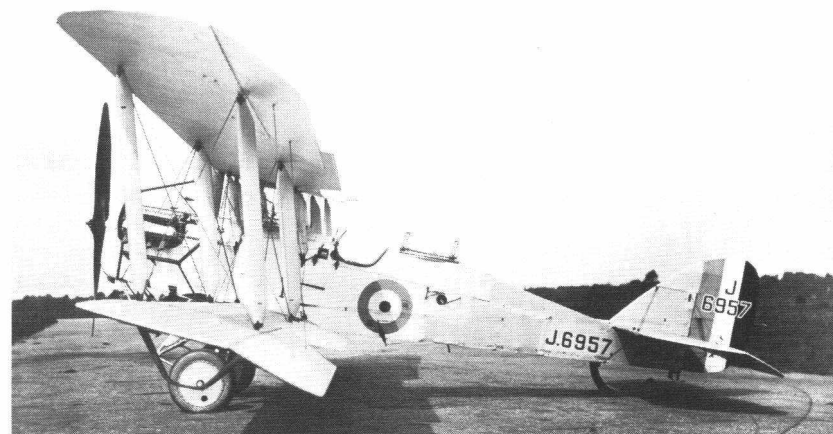
Lion II giving 465 h.p. and during the following month six of the other aircraft were stripped of military equipment and delivered by air to Aircraft Transport and Travel Ltd. at Hendon for use on the air mail service to the Army of Occupation on the Rhine. This service, begun by the R.A.F. with D.H.4s and D.H.9s on December 16, 1918, was handed over to civilian operation on August 15, 1919 and the Lion powered D.H.9A, with its high performance, made winter flying possible over the most difficult stage through the Ardennes. All six aircraft returned to the R.A.F. between April and June 1920 and in the following year one of them, *E752*, made deck landing trials on H.M. Aircraft Carrier *Eagle* even though not fitted with arrester hooks. *E746* made full load trials at Farnborough with the Lion II in 1920 and *E748*, with Lion II and 14 ft. 6 in. wide-track undercarriage, was delivered to Gosport on August 10, 1921. Another Lion II D.H.9A, *E775*, fitted with experimental folding wings, first flew at Farnborough on January 22, 1924 and was delivered to Gosport for carrier trials on March 29.



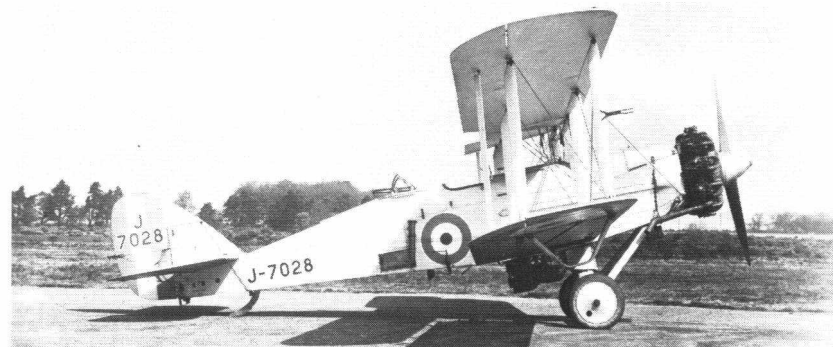
Capt. Gerald Gathergood with the D.H.9R, *K-172/G-EAHT*, c/n GR/1, at Amsterdam in July 1919. (Photo courtesy of Firth Vickers Stainless Steels Ltd.)

The D.H.9R sesquiplane racer erected from D.H.9A components by the Aircraft Manufacturing Co. Ltd. was also Lion powered. Test pilot Gerald Gathergood made a fast trip from Hendon to Amsterdam in this machine in 2 hours 10 minutes to attend the ELTA Exhibition in July 1919 and while there won the 137 mile closed circuit race at an average speed of 145 m.p.h. During September comparative trials were made against the D.H.4R and when the aircraft flew side by side, the much cruder D.H.4R proved to be marginally faster. On November 15th, Gathergood and the D.H.9R broke several British speed records at Hendon, and raised the closed circuit speed to 149.43 m.p.h.

So vast were the stocks of D.H.9A major assemblies and so limited the Air Ministry's financial resources, that contracts were three times awarded to the Westland Aircraft Works for aircraft using the maximum number

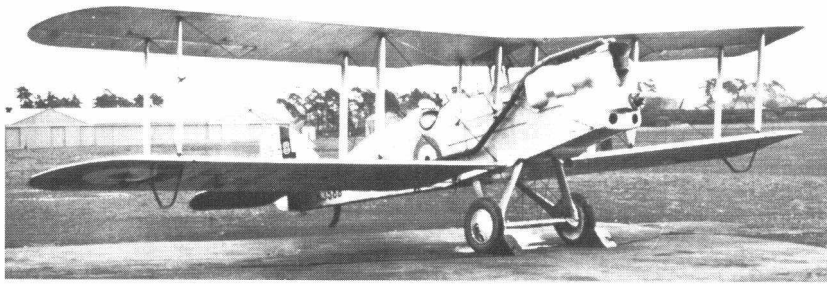


J.6957, first of the much modified Lion engined D.H.9A general purpose aircraft built by the Westland Aircraft Works in 1926-27.

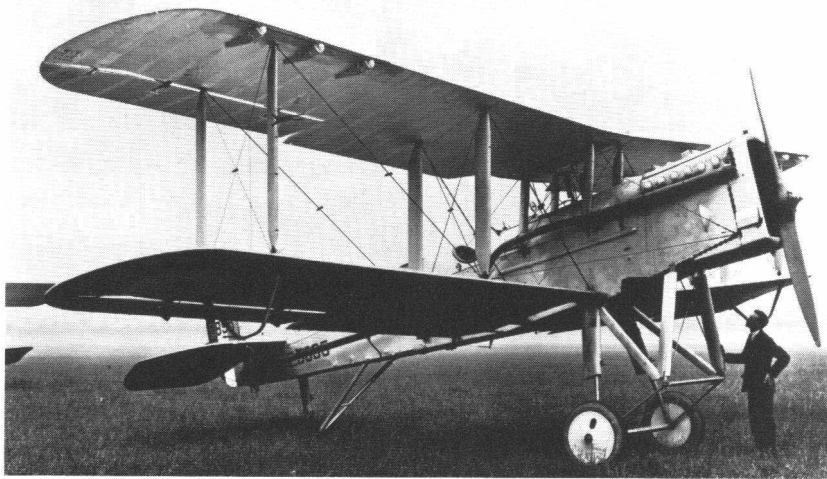


The D.H.9AJ Stag *J7028*, c/n 253, bombed up at Farnborough in 1926. (De Havilland Photo.)

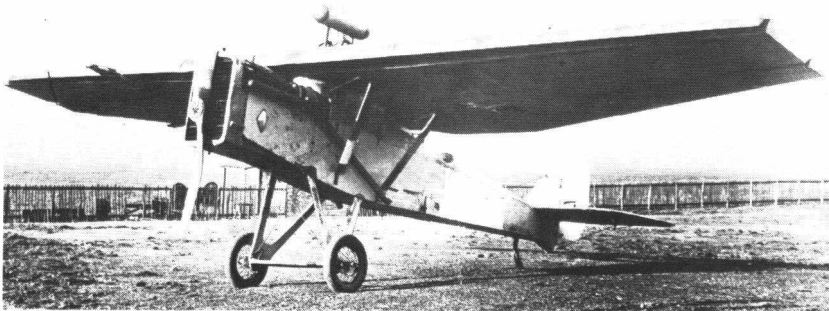
of D.H.9A components. The first, signed in 1920 was for 36 Westland Walrus fleet spotters, with Lion engines and unstaggered wings, heavily encumbered with grotesque naval excrescences. The Walrus was developed from an earlier prototype, the Tadpole *J6585* built by Armstrong Whitworth from D.H.9A components, including the Liberty power plant. In 1924 a small batch of somewhat similar Lion powered general purpose D.H.9As was ordered and the third contract, awarded in 1926, was for the quantity production of the Westland Wapiti with Bristol Jupiter engine. The final D.H.9A derivative, *J7028*, known as the D.H.9AJ Stag, although designed for the Lion engine was also completed with a Bristol



The D.H.9A serial *H3588* with aircooled Liberty 12 engine at the R.A.E., Farnborough in 1933. (Crown Copyright Reserved.)



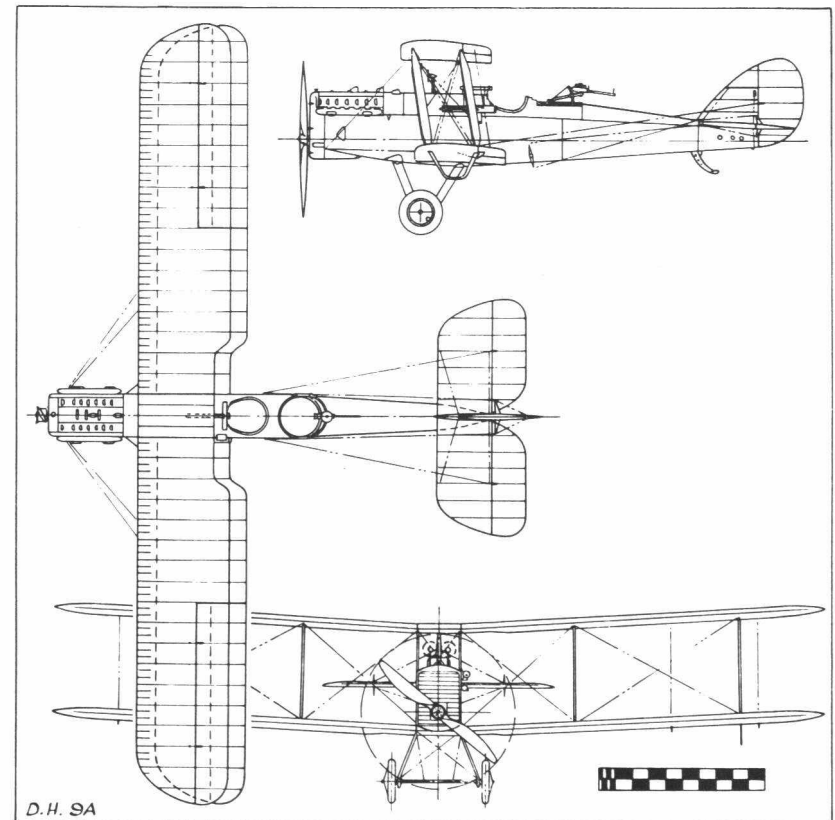
The experimental Vickers long stroke oleo undercarriage on D.H.9A *E9895* at Brooklands in 1933. (Vickers Photo.)



The H.P.20 research monoplane at Cricklewood in 1921. The fuselage, undercarriage and tail unit were those of the Westland-built D.H.9A *F1632*. (Handley Page Photo.)

Jupiter and first flown at Stag Lane by Hubert Broad for 40 minutes on June 15, 1926. It crashed at Martlesham during trials but was rebuilt by de Havillands and flew again on December 24, returning to Martlesham in February 1927. It was unsuccessful as a D.H.9A replacement but donated its engine to the prototype Westland Wapiti and its new-style oleo undercarriage to squadron D.H.9As as they came up for modernisation.

In the purely experimental sphere, a Westland built D.H.9A numbered *F1632* was denuded of its mainplanes by Handley Page Ltd. in 1921 and fitted with a thick section cantilever monoplane wing bolted to a small cabane on top of the fuselage. Designated H.P.20, it completed the practical tests begun with a modified D.H.9, *H9140*, on a full span, controllable slots, achieving a landing speed as low as 43 m.p.h. at a wing loading of 11 lb./sq. ft., representing a lift coefficient of 1.17. Another experimental aircraft was Liberty engined *E870*, which with Westland-built *J6957* (Lion II), was used by the R.A.E. for tests on steel airscrews in May 1924. *E865* took part in similar tests on Fairey-Reed duralumin airscrews in April 1925 and *E8444* was used for immersion tests at Felix-



D.H. 9A



Fitted with a 350 h.p. Rolls-Royce Eagle VIII cooled by Lamblin radiators between the undercarriage legs, *G-EBAN* was one of a number of D.H.9As ferried to the Spanish Air Force by the Aircraft Disposal Co. Ltd. in 1922.

stowe. In 1933 D.H.9A *H3588* was used at Farnborough for flight testing the aircooled Liberty 12 engine and in the same year *E9895* was fitted at Brooklands with an experimental Vickers long stroke oleo undercarriage. Another served as tanker in flight refuelling experiments with a Vickers Virginia over Farnborough in January 1931.

Because of its long R.A.F. service the D.H.9A figured less prominently on the secondhand market than did the D.H.9. A few brand new aircraft were taken over from F. W. Berwick and Co. Ltd. by the Aircraft Disposal Co. Ltd., six of which were civilianised at Croydon for racing or overseas demonstration. The first, *G-EAXC*, converted in 1922, made fastest time in the race for the Coupe Lamblin over the course Le Bourget-Brussels-Croydon-Le Bourget piloted by Rex Stocken. A second conversion, *G-EBCG*, appeared in 1922 fitted with a 350 h.p. Rolls-Royce Eagle VIII for participation in the Croydon Whitsun Races. For the first King's Cup Race which started at Croydon on September 8, 1922 the nose radiator



D.H.9A *A1-28*, with rear cockpit faired over, was winner of the 1928 Sydney Aerial Derby piloted by F/O Mulrooney R.A.A.F. (By courtesy of John Hopton.)

was removed in favour of small side radiators. This type of Eagle conversion was made originally to the military demonstrator *G-EBAN*, which, fitted with Lamblin radiators between the undercarriage legs, left for Madrid in February 1922 to take part in trials before Spanish Government officials, which led to an order for a batch of similar machines for the Spanish Air Force.

To enable the A.D.C. test pilot H. H. Perry to compete against Cobham's Lion engined D.H.9 in the King's Cup Race of July 12, 1923, John Kenworthy modified one of the Aircraft Disposal Company's D.H.9As *G-EBGX* to take the Lion. After a period of bad luck during which over zealous helpers broke the airscrew at Hendon on the morning of the race and F. T. Courtney forced landed at Brooklands during the Aerial Derby on August 6th, *GX* was disposed of overseas.

The D.H.9A *F1010*, displayed at the R.A.F. Museum, Hendon, was captured by the Germans during the First World War and exhibited at the Berlin Air Museum. Only the fuselage remained when it was recovered from Krakow, Poland, in 1980, with new wings and other components being built at the Cardington workshops. Its Liberty engine was obtained from the U.S.A..



One of the Lion engined D.H.9A mailplanes used by Aircraft Transport and Travel Ltd. on the Cologne service in 1919-20. On its return to the R.A.F. as *E752*, this particular aircraft made pioneer deck landing trials on H.M.S. *Eagle*. (Airco Photo.)

SPECIFICATION AND DATA

Manufacturers: The Aircraft Manufacturing Co. Ltd., Hendon, London, N.W.9
F. W. Berwick and Co. Ltd., Park Royal, London, N.W.10
Gloucestershire Aircraft Co. Ltd., Sunningend Works, Glos.
Handley Page Ltd., Cricklewood Aerodrome, London, N.W.2
H. G. Hawker Engineering Co. Ltd., Canbury Park Road, Kingston-on-Thames and Brooklands Aerodrome, Byfleet, Surrey
Mann, Egerton and Co. Ltd., Aylsham Road, Norwich, Norfolk
George Parnall and Co. Ltd., Yate Aerodrome, Glos.

S. E. Saunders Ltd., East Cowes, Isle of Wight
 Short Bros. (Rochester and Bedford) Ltd., Rochester, Kent
 The Vulcan Motor and Engineering Co. Ltd., Southport, Lancs.
 Westland Aircraft Works, Yeovil, Somerset
 Whitehead Aircraft Co. Ltd., Townshend Road, Richmond, Surrey
 The Dayton-Wright Airplane Co., Dayton, Ohio, U.S.A.
 The Engineering Division of the U.S. Army Air Service, McCook Field, Ohio

Power Plants: (D.H.9A) One 375 h.p. Rolls-Royce Eagle VIII
 One 400 h.p. Liberty 12
 One 400 h.p. aircooled Liberty 12
 One 450 h.p. Napier Lion
 One 465 h.p. Napier Lion II
 (D.H.9AJ) One 465 h.p. Bristol Jupiter VI
 (USD-9) One 400 h.p. Liberty 12
 (USD-9A) One 400 h.p. Liberty 12
 (USD-9B) One 420 h.p. Liberty 12A
 (H.P.20) One 400 h.p. Liberty 12

Dimensions: Span 45 ft. 11 $\frac{3}{4}$ in. Length 30 ft. 3 in. (Lion) 29 ft. 2 in.
 Height 11 ft. 4 in. Wing area 486 $\frac{3}{4}$ sq. ft. (D.H.9AJ) 491 sq. ft.

Weights and Performances:

Engine	D.H.9A			Stag
	Liberty	Eagle VIII	Lion	Jupiter VI
Tare weight . . .	2,800 lb.	2,705 lb.	2,988 lb.	2,740 lb.
All-up weight . . .	4,645 lb.*	4,223 lb.	4,814 lb.	4,324 lb.
Speed at 10,000 ft. .	114 $\frac{1}{2}$ m.p.h.	118 m.p.h.	123 m.p.h.	130 m.p.h.
Initial climb . . .	890 ft./min.	850 ft./min.	1,100 ft./min.	900 ft./min.
Ceiling . . .	16,750 ft.	16,000 ft.	19,000 ft.	19,900 ft.
Duration . . .	5 $\frac{1}{4}$ hours	3 $\frac{1}{2}$ hours	—	—

* USD-9A 4,900 lb.

British Production:

Serial range	Manufacturer	Serial range	Manufacturer
<i>E701</i> to <i>E1100</i>	Whitehead	†† <i>J6957</i> to <i>J6962</i>	Westland
<i>E8407</i> to <i>E8806</i>	Airco	<i>J6963</i> to <i>J6968</i>	Handley Page
<i>E9657</i> to <i>E9756</i>	Mann, Egerton	<i>J7249</i> to <i>J7258</i>	Gloster
<i>E9857</i> to <i>E9956</i>	Vulcan	<i>J7700</i>	Airco
<i>F951</i> to <i>F1100</i>	Westland	<i>J7787</i> to <i>J7798</i>	de Havilland
<i>F1603</i> to <i>F1652</i>	Westland	<i>J7799</i> to <i>J7819</i>	Westland
<i>F2733</i> to <i>F2882</i>	Berwick	<i>J7823</i> to <i>J7834</i>	Short Bros.
<i>H1</i> to <i>H200</i>	Airco	<i>J7835</i> to <i>J7854</i>	Hawker
<i>H3396</i> to <i>H3545</i>	Westland	<i>J7855</i> to <i>J7866</i>	Westland
* <i>H3546</i> to <i>H3795</i>	Vulcan	<i>J7867</i> to <i>J7876</i>	Hawker
** <i>H4216</i> to <i>H4315</i>	Airco	<i>J7877</i> to <i>J7883</i>	de Havilland
<i>J401</i> to <i>J450</i>	Westland	<i>J7884</i> to <i>J7890</i>	Short Bros.
* <i>J551</i> to <i>J600</i>	Mann, Egerton	<i>J8460</i> to <i>J8482</i>	Westland
† <i>J5192</i> to <i>J5491</i>	Airco	<i>J8483</i> to <i>J8494</i>	Parnall

Aircraft reconditioned 1924–26 by Blackburn, Gloster, de Havilland, Handley Page, Hawker, Parnall, R.A.F. Ascot, Saunders, Short Bros. and Westland and allotted new serial numbers: *J7008* to *J7127*, *J7302* to *J7321*, *J7327* to *J7356*, *J7604* to *J7615*, *J8096* to *J8225*.

* Not all delivered ** Some completed as D.H.9s † Lion engines †† Order cancelled

American Production: Four USD-9As by Dayton-Wright, five by the Engineering Division; United States Army serials (McCook Field project numbers in parentheses) *A.S.40044* (P64); *40060* (P43); *40061* (P47); *40062* (P50) shipped overseas 4.1.19; *40063* (P51) shipped overseas 7.11.18; *40067* (P71); *40068* (P74); *40118* (P80) pressurisation experiments 1921; *40119* (P60) crashed at Toledo 3.7.19. Four USD-9s including *A.S.40026* (P36); *40042* (P40); *40043* (P45).

D.H.9As built or reconditioned by the de Havilland Aircraft Co. Ltd. at Stag Lane 1920–27:

Constructor's Numbers	R.A.F. serials
17	<i>E8788</i> delivered by air to Waddon 3.12.21
18–24	By road to Waddon on the dates given— <i>E979</i> (6.12.21), <i>E8780</i> (14.12.21), <i>H3650</i> (14.12.21), <i>E8782</i> (19.12.21), <i>E989</i> (22.12.21), <i>F2869</i> (27.12.21), <i>H3646</i> (2.2.22)
37	In khaki drab with red star and Eagle VIII for Russia, May 1922
42	<i>A1–30</i> for the Royal Australian Air Force 1923
46–55	<i>E8652</i> , <i>E8615</i> , <i>E8622</i> , <i>E8610</i> , <i>J560</i> , <i>J555</i> , <i>H3430</i> , <i>H3486</i> , <i>J554</i> , <i>H3432</i>
67–72	<i>H147</i> , <i>H143</i> , <i>H141</i> , <i>H145</i> , <i>E863</i> , <i>E9690</i>
78–81	<i>E8592</i> , <i>E925</i> , <i>H3520</i> , <i>E9657</i> (by road to Gosport)
88–97	<i>J7008</i> to <i>J7017</i> (formerly <i>H3480</i> , <i>E861</i> , <i>H3496</i> , <i>H3397</i> , <i>E857</i> , <i>H111</i> , <i>H126</i> , <i>H128</i> , <i>E859</i> , <i>E960</i>)
119–126	<i>J7302</i> to <i>J7309</i> (formerly <i>H3617</i> , <i>H3581</i> , <i>F2828</i> , <i>H3595</i> , <i>E8710</i> , <i>E8700</i> , <i>E8699</i> , <i>E8702</i>)
140–150	<i>E8694</i> , <i>E9951</i> , <i>F2818</i> , <i>J561</i> , <i>H3541</i> , <i>H3550</i> , <i>J7034</i> , <i>F979</i> , <i>H3506</i> , <i>E8725</i> , <i>H138</i>
153–157	<i>E828</i> , <i>E8655</i> , <i>E8744</i> , <i>E8805</i> , <i>E8758</i>
159–167	<i>H3630</i> , <i>H88</i> , <i>E8761</i> , <i>J7117</i> , <i>E9918</i> , <i>J7038</i> , <i>H3566</i> , <i>E777</i> , <i>E770</i>
170–180	<i>F2842</i> , <i>E805</i> , <i>E911</i> , <i>E8755</i> , <i>E8589</i> , <i>E887</i> , <i>E875</i> , <i>E8637</i> , <i>E8754</i> , <i>H3643</i> , <i>J7030</i> under A.M. Contract 579165/25
202–220	<i>J7787</i> to <i>J7798</i> , <i>J7877</i> to <i>J7883</i> under A.M. Contract 623200/25
222–232	<i>J7607</i> , <i>E959</i> , <i>J7356</i> , <i>E8728</i> , <i>J6964</i> , <i>J7058</i> , <i>J7122</i> , <i>E969</i> , <i>E789</i> , <i>E9951</i> , <i>J7606</i> under A.M. Contract 579165/25
252–258	<i>H3520*</i> , <i>J7028**</i> , <i>E8759</i> , <i>F1023</i> , <i>E9891</i> , <i>E788</i> , <i>J7048</i> under A.M. Contract 579165/25
221, 259	<i>J8129</i> , <i>J8130</i> } under A.M. Contract 700821/26 (<i>J8148–53</i> with metal
286–308	<i>J8131</i> to <i>J8153</i>) wings)
309–316	<i>E8596</i> , <i>E8805</i> , <i>F2847</i> , <i>J7809</i> , <i>J7605</i> , <i>J7083</i> , <i>J7047</i> (dual trainer), <i>F1641</i> under A.M. Contract 726079/26
317–322	<i>J7081</i> , <i>J8461</i> , <i>J8473</i> , <i>J7009</i> , <i>J7059</i> , <i>J8466</i> under Dual Trainer A.M. Contract 760139/27

* Second rebuild. ** D.H.9AJ Stag.

Note: These airframes were of miscellaneous origin but after thorough reconditioning were entered in the Company's production records and for the first time allotted de Havilland constructor's numbers.

War Service: On the Western Front with Nos. 18, 99, 110 and 205 Squadrons R.A.F.; in Russia with Nos. 47 and 221 Squadrons; on Coastal patrol with Nos. 212 (Dover) and 273 Squadrons; also with training stations, e.g. Cranwell and Waddington.

Post-war Service: (a) In the United Kingdom with No. 11 Squadron (Andover); No. 12 (Andover); No. 15 (Martlesham); No. 24 (Hendon); No. 35 (Bircham Newton); No. 39 (Spittlegate and Bircham Newton); No. 100 (Spittlegate); No. 207 (Bircham Newton and Eastchurch); No. 501 (Filton); No. 600 (Northolt and Hendon); No. 601 (Northolt and Hendon); No. 602 (Renfrew); No. 603 (Turnhouse); No. 605 (Castle Bromwich). (b) Overseas with No. 8 Squadron (Iraq and Aden); No. 14 (Palestine); No. 27 (India); No. 30 (India); No. 45 (Egypt); No. 47 (Egypt); No. 55 (Iraq); No. 60 (India); No. 84 (Iraq).



J7787, c/n 202, first wholly new, non-Airco, D.H.9A built by de Havillands, ready for delivery from Stag Lane on January 12, 1926. (P. T. Capon Photo.)

Civil Conversions:

(a) Lion engined mailplanes for Aircraft Transport and Travel Ltd.

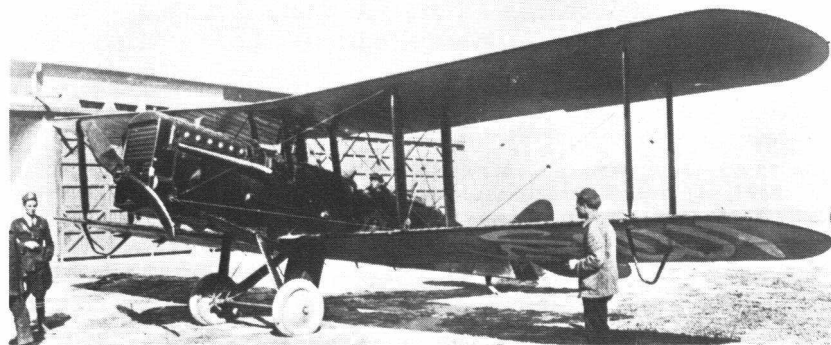
E750 . G-EAOF	E753 . G-EAOH	E756 . G-EAOJ
E752 . G-EAOG	E754 . G-EAOI	E757 . G-EAOK

(b) Markings carried by Canadian Air Board Civil Operations D.H.9As

E1000 . G-CYAD	E1002 . G-CYAO	E993 . G-CYBN
E998 . G-CYAJ	E997 . G-CYAZ	E1001 . G-CYCG
E994 . G-CYAK	E995 . G-CYBF	E999 . G-CYDO
E996 . G-CYAN	E992 . G-CYBI	

(c) Aircraft Disposal Co. Ltd. demonstration aircraft

E8791 . G-EAXC . Liberty 12	F2868 . G-EBCG . Eagle VIII
E8788 . G-EBAC . Liberty 12	F2872 . G-EBGX . Lion
F2867 . G-EBAN . Eagle VIII	E8781 . G-EBLC . Liberty 12



One of a squadron of twelve R-1 aircraft (Russian-built D.H.9As) presented to Afghanistan in 1925 and delivered over 15,000 ft. mountains from Tashkent to Kabul.



"Albatross" flown by the Brisbane section of the Australian Aero Club in 1929, was typical of the majority of demilitarised 'straight Puma Nines'. (J. F. McNulty Photo.)

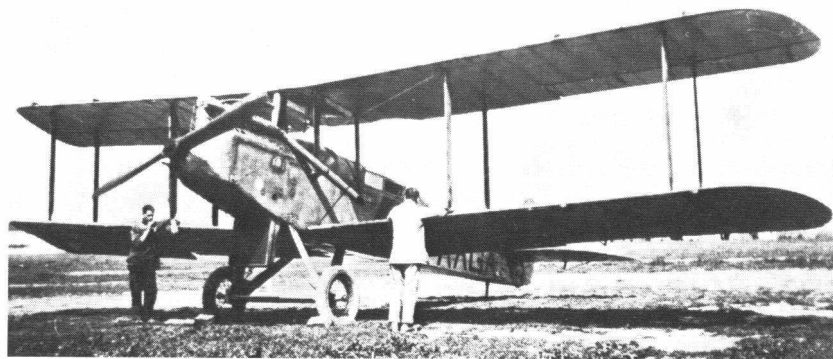
De Havilland D.H.9 (Civil), D.H.9B and D.H.9C

The demilitarised D.H.9 was used extensively by air transport concerns in the years immediately following the First World War and to exploit the full load carrying capacity of this cheap and rugged aircraft, extensive modifications were devised by the Aircraft Manufacturing Co. Ltd., the de Havilland Aircraft Co. Ltd. and later by the Aircraft Disposal Co. Ltd. Pioneer air services between London, Paris and Amsterdam operated by Aircraft Transport and Travel Ltd. in 1919–20 employed sixteen D.H.9s, eight of which were newly erected by the infant de Havilland Aircraft Co. Ltd. at Stag Lane Aerodrome, Edgware, Middlesex and the remainder surplus Government stock stripped of military equipment. Some were fitted with the B.H.P. engine and others with the Siddeley Puma. One of them, C6054, was the first aircraft to make a flight for other than military or experimental purposes in this country, and for this it was allotted, but did not carry, the first permanent British registration marking G-EAAA. Its commercial life was confined to the early hours of the morning of May 1, 1919 because bad weather delayed its departure from Hendon from midnight until it took off piloted by Capt. H. J. Saint at 4.30 a.m. with newspapers for Bournemouth. Thick mist was encountered and an hour later the machine was wrecked on Portsdown Hill, north of Portsmouth.

Some of the Amsterdam services were flown under contract to K.L.M., the Royal Dutch Air Line, which at that time had no aircraft of its own, but when Aircraft Transport and Travel Ltd. closed down, four of its

D.H.9s were taken over by K.L.M. to fly in competition with ten machines of the same type flown over the same route by Handley Page Transport Ltd. At least five D.H.9s also operated between Croydon or Cricklewood and Brussels in 1920–21, often flying in groups of two or three on the services of the Belgian air line SNETA. Another of the former A.T. & T. D.H.9s, *G-EAQP*, went to Newfoundland in 1922 to join the Aerial Survey Company founded by F. S. Cotton for seal and fishery spotting and for taxi work during the gold rush at Stag Bay, Labrador.

The earliest civil conversions merely involved the removal of the Scarff ring, bomb racks and other armament but by the end of 1919 nearly all D.H.9s flying on Continental services had been equipped to carry a second passenger in front of the pilot. In this form it was known as the D.H.9B but late in 1921 the de Havilland company further increased the load carrying capacity by a rearward extension of the back cockpit to accommodate light freight or a third passenger. The designation D.H.9C was coined to cover this version and at least 12 were erected at Stag Lane in 1922–23, the first two of which left Croydon on September 23, 1921 piloted by A. J. (later Sir Alan) Cobham, F. J. Ortweiler and C. D. Barnard on delivery to the Cia Española del Trafico Aero for a subsidised air mail service started in January 1922 between Seville and Larache in Spanish Morocco. Three British pilots, F. W. Hatchett, Sidney St. Barbe and C. F. Wolley Dod were initially employed, and the 9Cs gave quite extraordinary service for nearly seven years. F. W. Hatchett remained with the company and in 1929 was still flying over the original route in the surviving 9C *M-AAGA* which he had personally maintained through the years and considerably modified to suit changing conditions. All the pilot's controls and instrumentation were redesigned and moved into the rear cockpit and the front fuselage was widened to accommodate two passengers and mail and covered with a low cabin roof of local manufacture.



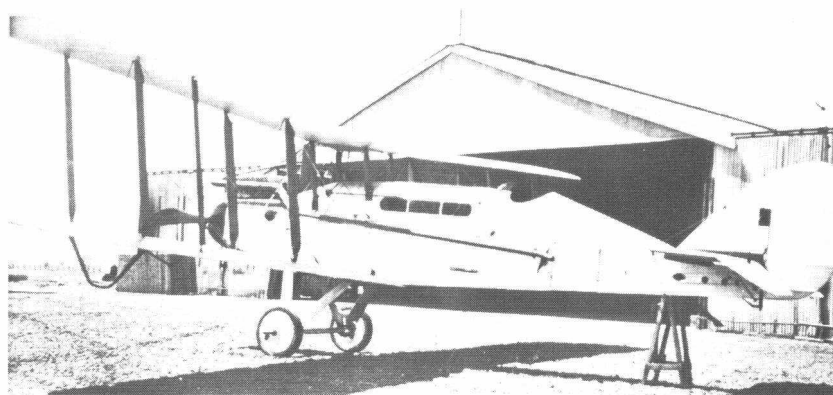
D.H.9C *M-AAGA*, c/n 12, of Cia Española del Trafico Aero after the fuselage had been widened and a glazed cabin installed by F. W. Hatchett.



The prototype D.H.9C, *G-EAYT*, in which A. J. Cobham flew long distance charters for the de Havilland Hire Service in 1922.

All passengers carried in D.H.9s wore helmet, goggles and flying clothing provided by the company concerned and in winter were issued with hot water bottles. To improve the hard lot of the passenger, the de Havilland Aircraft Co. Ltd. devised a further modification converting the rear cockpit into a cabin for two passengers face to face. A light wood and fabric roof hinged about the port upper longeron for ease of entry and although at first the windows remained unglazed, hinged wind deflectors were fitted at the front end to make conversation possible. At this stage it was felt advisable to compensate for the aft movement of the centre of gravity and the wings were given 8 inches of sweep back measured at the outer interplane strut. In this form it was still known as the D.H.9C, the first completed being the khaki drab *G-EAYT* in which A. J. Cobham made several long distance charter flights to North Africa and the Near East. Its short life ended in the sea when fog overtook it while landing at Venice Lido in October 1922. For the carriage of light freight or for the convenience of cameramen, the cabin top was often removed altogether and many of the Hire Service D.H.9Cs flew permanently in this condition. Some 150,000 miles were flown in 1922–23, in the course of which the earliest recorded crop spraying sortie was made in Kent in June 1922. When pensioned off in 1924, D.H.9C *G-EAYU* was sold with several military D.H.9s to the Hedjaz Government but unfortunately the ground crew fused some bombs incorrectly and 'YU and its Russian pilot were blown to pieces before reaching the rebel tribesmen.

Eight D.H.9Cs based at Stag Lane formed the fleet of the de Havilland Aeroplane Hire Service in 1922. They flew hundreds of hours to all parts of Europe and the British Isles at a charge of £8 per hour, mainly on hire to film and newspaper companies wishing to cover distant events in time for their next editions. *G-EBGU* was fitted at Croydon with an illuminated sign advertising the *Star* newspaper which Hubert Broad flew over London in a 2 hr. 40 min. night sortie on February 12, 1924.



G-AUFM "Ion", built at Longreach by QANTAS 1926-27 with D.H.50 mainplanes and the pilot behind the cabin. (QANTAS Photo.)



O-BELG, a D.H.9 fitted with D.H.4A cabin top and underwing luggage containers by the Belgian concern SNETA.



The other SNETA conversion O-BATA after modernisation as G-EBUM at Stag Lane in 1927 for the Vintcent-Newall India Flight. (Photo courtesy of D. C. Fuller.)

Two D.H.9Cs, *G-AUED* and *'EF'*, supplied to QANTAS for the 385 mile Charleville-Cloncurry route, opened on November 3, 1922, became the first successful cabin aircraft to operate scheduled services in Australia. They were joined by *G-AUEU*, converted by H. C. Miller, and by *G-AUFM "Ion"*—wholly built at Longreach with a fuselage of QANTAS design which had D.H.9C dimensions but D.H.50 layout with the pilot in an open cockpit behind a covered compartment for three passengers. It had the Puma from the crashed D.H.9C *G-AUEF*, D.H.50 mainplanes, and also extended axles for dual wheel operation from boggy aerodromes. It first flew on February 5, 1927 but after a landing accident at Camooweal on January 13, 1928 was flown to Longreach and dismantled. The wings, engine and propeller were used in the construction of the D.H.50 *G-AUJS*.

A much more elaborate cabin conversion was made in Brussels by the Belgian concern SNETA which equipped two of their D.H.9s with the cabin tops and Triplex sliding windows removed from their defunct D.H.4As. Additional luggage space was provided under the fuselage and also in special containers under the lower mainplane just outboard of the undercarriage. These aircraft were acquired by F/Os Nevill Vintcent and J. S. Newall in 1927 and flew to Stag Lane for modernisation which included the fitting of nose radiators and centre section fuel tanks of the type then in production for D.H.50s, an undercarriage incorporating the new D.H. system of rubber-in-compression, and Dunlop car tyres to reduce puncture risk. Leaving Stag Lane on January 9, 1928 they made a leisurely flight to India, arriving at Karachi on April 26th to commence a tour of the sub-continent during which 5,000 passengers were given flights and the foundations of Indian air transport were laid.

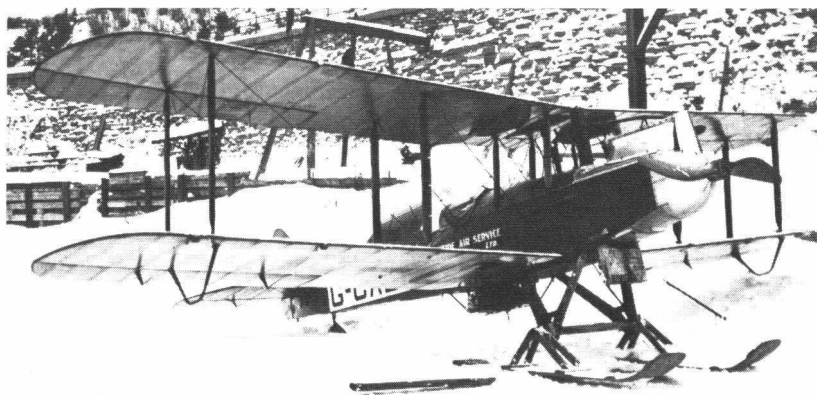
The Aircraft Disposal Co. Ltd. at Croydon was responsible for the civil conversion of a very considerable number of D.H.9s but worked independently of the manufacturers and produced its own series of modifications. These inevitably began with the simplest type of demilitarised two seaters, some examples of which took part in long distance flights. One of the most famous was *F1287/G-EAQM* in which R. J. P. Parer left Hounslow on January 8, 1920 with J. C. McIntosh as co-pilot and succeeded in reaching Darwin in an extremely patched up condition on August 2nd to complete the first flight ever made by a single engined aircraft between England and Australia. Although considerably damaged in a crash on the last leg of the flight the aircraft was repaired and exhibited for some years at Parer's old school at Bathurst, N.S.W. before going to the Australian War Memorial at Canberra. The first flight from England to Cape Town although begun by a Vickers Vimy, was completed by Pierre van Ryneveld and Quintin Brand in a D.H.9 *H5648* named "Voortrekker". Discarded Imperial Gift D.H.9s served in the Dominions for many years on scheduled services such as those run by the South African Air Force (see page 101) and QANTAS in Australia. New Zealand, having no Air Force, lent three each of its nine D.H.9s free of charge to the N.Z. Flying School, Auckland (*F1252*, *H5546*, *H5641*); the Canterbury Aviation Co.,

Christchurch; and the N.Z. Aero Transport Co., Timaru. On April 4, 1922 Canterbury's D.H.9 *D3136/G-NZAH* completed the first flight ever made between Gisborne and Auckland and the New Zealand Aero Transport D.H.9 *D3139/G-NZAM* later became the first aircraft to make the direct flight from Invercargill to Auckland.

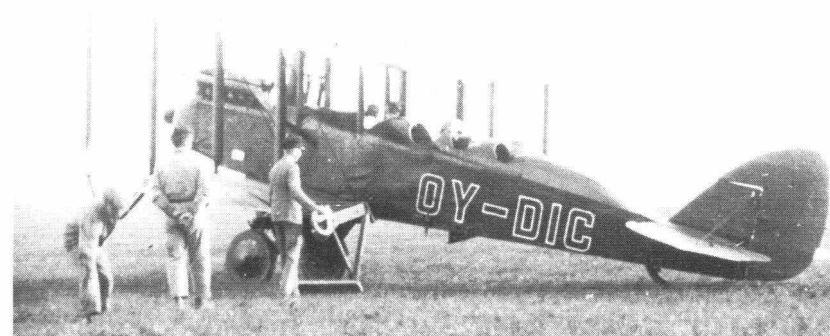
By 1922 nearly all the important long distance flights had been accomplished and only the round-the-world flight had not yet been attempted. An expedition for this purpose was therefore organised by Major W. T. Blake who planned to fly the overland stages between London–Calcutta and Vancouver–Montreal with D.H.9s. To avoid adverse publicity when the first machine, *G-EBDE*, was damaged at Istres, France, on the first day, the third aircraft, *G-EBDL*, was repainted as 'DE' and succeeded in reaching Calcutta where the flight was abandoned. The unused second



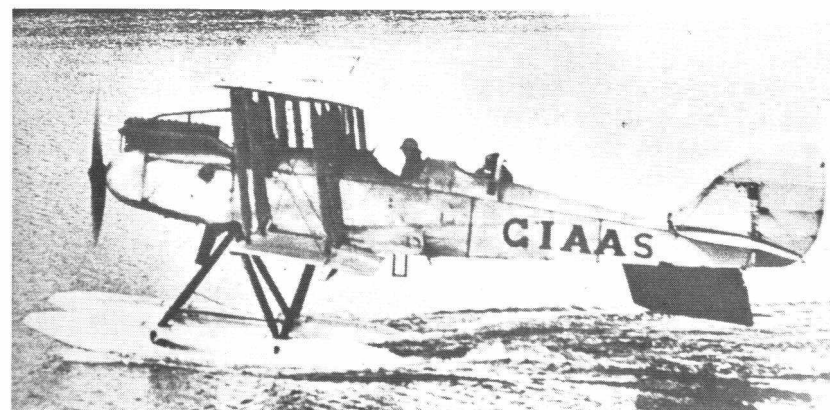
The D.H.9 in which Capt. H. C. Miller won the 2,390 mile Sydney–Perth Race in 1929. It is shown being groomed for the 1936 Brisbane–Adelaide Race. (By courtesy of John Hopton.)



Originally intended for the Canadian section of Maj. W. T. Blake's World Flight in 1923, D.H.9 *G-CAEU* was fitted with the cabin of a D.H.9C and operated by the Laurentide Air Service on skis in 1924. (R.C.A.F. Photo.)



One of the four Puma engined D.H.9s rebuilt by A.D.C. Ltd. as four seaters for the Danish Air Transport Company in 1920.



One of the D.H.9 floatplanes with which the Air Survey Co. Ltd. mapped the River Irrawaddy in 1924. (Short Photo.)

aircraft, *G-EBDF*, was leased to de Havillands 1923–25 and then sold to Laurentide Air Service, Lac a la Tortue, Canada, as *G-CAEU*.

The Disposals Company favoured neither the double rear cockpit nor the cabin top and their conversions were fitted mainly with four individual cockpits one behind the other. Entry to the rearmost pair was simplified by hinging the decking along the port side, a device incorporated in most of the aircraft overhauled at Croydon during more than ten years. Over 60 four seat D.H.9s of this type were supplied to Rumania by May 1922 and four to the Danish firm Det Danske Luftfartselskab A/S whose first service with land aircraft was opened on September 15, 1920 when D.H.9 *T-DOGH* flew from Copenhagen to Hamburg. When the route closed on October 31st the four machines had carried 83 passengers and 1,160 kg of mail. On April 17, 1923 the route was reopened with three surviving

D.H.9s, 311 scheduled services being completed before the last flight of the season on October 17, 1923. One of these aircraft was kept airworthy for pleasure flying until 1930 by the cannibalisation of the other two. In 1924 two 2 seat Puma Nines were shipped to the British and Egyptian Tea Co. Ltd., one of which was test flown at Rochester with Short wooden main and tail floats. Undercarriages of this type were fitted to D.H.9s used by the Air Survey Co. Ltd. during the Irrawaddy, Sarawak and Indian surveys in 1924-25, and for a number supplied to Bolivia. The first of these, *AM-1*, was erected and test flown by J. R. 'Joe' King at Riberalta on the Rio Beni in 1925.

After 1924 the A.D.C. company no longer fitted a cockpit ahead of the pilot and later conversions such as *G-EBJW* and '*JX*', supplied to Northern Air Lines for a short lived Stranraer-Belfast service, were three seaters fitted with the 300 h.p. A.D.C. Nimbus, Major Halford's re-design of the 230 h.p. Siddeley Puma. Thus after 10 years and two modifications, the designed power of the original B.H.P. engine was at last achieved. The Nimbus was also fitted to two special D.H.9s *G-EBPE* and '*PF*' erected at Stag Lane in 1926 for an aerial survey of Northern Rhodesia by the Aircraft Operating Co. Ltd. They were equipped as two seaters having a camera position under the tail and twin metal floats 21 ft. 9 in. long of the type built by Short Bros. for Sir Alan Cobham's D.H.50J. After transportation through the jungle on Ford trucks and erection by native labour they operated from the Zambesi River, '*PF*' alone successfully photographing 52,000 square miles of the Copper Belt.

Conversions to full swept wing D.H.9C standard by outside firms was confined to *G-AUFM* by QANTAS at Longreach; *G-AUEU* by H. C. Miller at Albert Park Aerodrome, Adelaide, S.A.; *H4890/G-EBDG* by the Manchester Aviation Co. Ltd. at Alexandra Park and *H5886/G-EBIG* by Berkshire Aviation Tours Ltd. at Monkmoor Aerodrome, Shrewsbury. Both the latter served with Northern Air Lines on the abortive Stranraer-Belfast service in 1925 and afterwards as joyriding machines at Barton until 1930.

On April 1, 1923 the de Havilland company was awarded a contract for training R.A.F. Reservists and employed Hire Service D.H.9Cs for this purpose. By the end of 1924 these had been replaced by seven Puma engined D.H.9s equipped as two seat advanced trainers, comprising six newly erected machines and the company's oldest retainer, *G-EAAC*, specially preserved as a practical investigation into the longevity of aeroplanes under normal flying conditions. Two similar machines were also erected for the Beardmore School at Renfrew and another, *G-EBHV*, supplied to the Armstrong Whitworth Reserve School at Whitley, was fitted with an additional pair of bungee shock absorber struts in the undercarriage.

In common with most open cockpit types the D.H.9 occasionally appeared as a single seat racer as in the 1922 King's Cup Race when *G-EAAC*, *G-EBEN* and '*EP*' came third, fourth and tenth respectively. In

the following year the de Havilland Hire Service machine *G-EBEZ* was fitted temporarily with a 450 h.p. Napier Lion with which it came second at 144.7 m.p.h. piloted by Cobham, and in 1927 W. G. R. Hinchliffe reached fourth place at 123.6 m.p.h. in a special single seater *G-EBKO* with A.D.C. Nimbus engine. The most spectacular result was achieved by the standard two seater *VH-UHT* in which H. C. Miller won the £1,000 first prize in the handicap section of the 2,200 mile Western Australia Centenary Air Race from Sydney to Perth in September 1929.

In 1936 when the type was nearly at the end of its career Aerial Sites Ltd. of Hanworth employed *G-AACP* for banner towing and Sir Alan Cobham used '*CR*' for early flight refuelling experiments at Ford, Sussex. For this purpose the hinged decking to the rear cockpits was entirely removed to provide maximum working space.



A. J. Cobham taking off in the Lion engined D.H.9 *G-EBEZ*, c/n 66, in the 1923 King's Cup Race. (Leonard Bridgman Photo.)

SPECIFICATION AND DATA

Manufacturers: The Aircraft Manufacturing Co. Ltd., Hendon, London, N.W.9 and sub-contractors listed on page 103.

Conversions by: The Aircraft Manufacturing Co. Ltd., Hendon, London, N.W.9
The de Havilland Aircraft Co. Ltd., Stag Lane Aerodrome, Edgware, Middlesex
Handley Page Ltd., Cricklewood Aerodrome, London, N.W.2
The Aircraft Disposal Co. Ltd., Croydon Aerodrome, Surrey
Northern Air Lines, Alexandra Park, Manchester
Berkshire Aviation Tours Ltd., Monkmoor Aerodrome, Shrewsbury
Queensland and Northern Territory Aerial Services Ltd. (QANTAS), Longreach, Queensland, Australia
Miller Aviation Ltd., Albert Park Aerodrome, Adelaide, South Australia
Syndicat National pour l'Etude des Transports Aeriens (SNETA), Brussels, Belgium

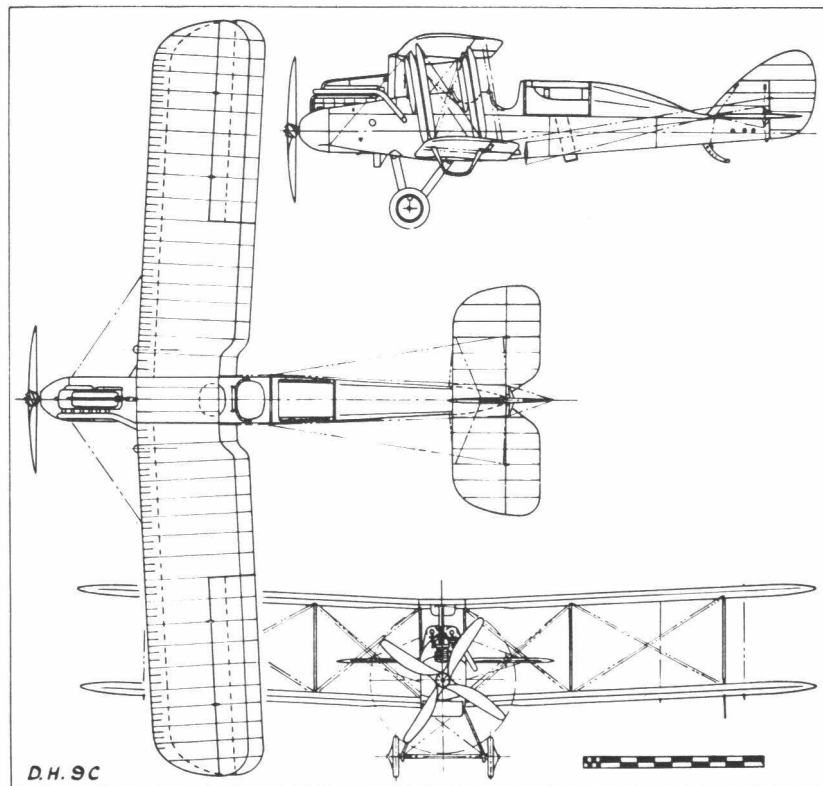
Power Plants: One 230 h.p. B.H.P.
One 240 h.p. Siddeley Puma
One 300 h.p. A.D.C. Nimbus
One 450 h.p. Napier Lion

Dimensions: Span 42 ft. 4 $\frac{1}{2}$ in. Length 30 ft. 6 in.
Height 11 ft. 2 in. Wing area 434 sq. ft.

Weights and Performances:

	D.H.9			D.H.9B	D.H.9C
	B.H.P.	Puma	Lion	Puma	Puma
Tare weight	2,193 lb.	2,230 lb.	2,544 lb.	2,504 lb.	2,600 lb.
All-up weight	3,420 lb.	3,900 lb.	3,667 lb.	3,900 lb.	3,300 lb.
Maximum speed	114.0 m.p.h.	110.5 m.p.h.	144.0 m.p.h.	—	115.0 m.p.h.*
Initial climb	750 ft./min.	650 ft./min.	1,800 ft./min.	—	600 ft./min.
Ceiling	18,000 ft.	15,500 ft.	24,500 ft.	—	19,000 ft.
Duration/Range	4 hours	4 hours	3 $\frac{1}{2}$ hours	—	500 miles

* Cruising speed 95 m.p.h.



D.H.9C

D.H.9 and D.H.9B Civil Conversions:

(Arranged to show the type of conversion and by or for whom it was made.)

Constructor's No.
(or R.A.F. Serial)
and Registration

C. of A.
Issued

Type and Remarks

Aircraft Disposal Co. Ltd.

F1278	G-EAQM	2. 1.20	2 seater: R. J. P. Parer's Australia flight
H5839	G-EAZH	Nil	3 seater
H5860	G-EAZI	Nil	3 seater
H5688	G-EBEN	3. 1.24	2 seater: for the British and Egyptian Tea Co. Ltd.
D5799	G-EBEP	26. 9.22	2 seater: for the Duke of Sutherland
H9289	G-EBJR	1. 8.24	Floatplane: airframe overhauled by D.H.s and allotted c/n 158. To the British and Egyptian Tea Co. Ltd.
H9337	G-EBKV	17. 4. 25	3 seater: demonstrator, sold abroad 1927
H9369	G-EBTR	11. 1.28	2 seater Nimbus: demonstrator, sold abroad 9.30
H9276	G-EBXR	13. 8.28	2 seater Nimbus: sold in Australia as G-AUJA, crashed at Salamaua, N.G., 2.11.29
—	G-IAAG	Nil	2 seater: Rajah Mahomed Mumtaz Ali Khan, India

Armstrong Whitworth Reserve Flying School, Whitley

H5844	G-EBHV	12.11.23	2 seat trainer: converted to D.H.9J in 1926
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Aircraft Transport and Travel Ltd. (military conversions)

C6054	G-EAAA	Nil	D.H.9: crashed on Portsdown Hill 1.5.19
H9277	K-109	7. 5.19	D.H.9B: later G-EAAC "Antiopa", converted to D.H.9J in 1927
H9273	G-EAAD	Nil	D.H.9: sold abroad 9.9.19
H9255	G-EAGX	7. 8.19	D.H.9B: "Ancuba", crashed 9.20
H9258	G-EAGY	12. 8.19	D.H.9B: sold abroad 1.21
D2884	G-EALJ	Nil	D.H.9: conversion abandoned
D5622	G-EAMX	Nil	D.H.9: sold abroad 4.20
H5579	G-EAOP	Nil	D.H.9: written off 9.20

Aircraft Transport and Travel Ltd. (Airco civil production)

P.32E	G-EAOZ	17.11.19	D.H.9B: to K.L.M. 7.21 as H-NABF
P.33E	G-EAPL	28.11.19	D.H.9B: to K.L.M. 7.21 as H-NABE
P.34E	G-EAPO	6.12.19	D.H.9B: written off 9.20
P.35E	G-EAPU	29.12.19	D.H.9B: written off 11.20
P.36E	G-EAQA	12. 1.20	D.H.9B: crashed 1.21
P.37E	G-EAQN	28. 1.20	D.H.9B: crashed 12.20
P.38E	G-EAQL	24. 1.20	D.H.9B: sold abroad 7.21
P.39E	G-EAQP	9. 2.20	D.H.9B: to Newfoundland 1.22
P.60E	G-EAVK	20. 9.20	D.H.9B: sold abroad 3.22

Aircraft Operating Co. Ltd. (survey aircraft, Nimbus engine)

H9319	G-EBKO	17. 4.25	2 seater: scrapped in 1930
H9205	G-EBQD	21. 4.27	3 seater: scrapped in 1930
284	G-EBPE	21.12.26	2 seater: de Havilland built
285	G-EBPF	21.12.26	2 seater: de Havilland built



Seating two in the enlarged rear cockpit, the former A.T. & T. D.H.9B *G-EAOZ*, flew 153 hours with K.L.M. as *H-NABF* and was scrapped in 1924.

Constructor's No.
(or R.A.F. Serial)
and Registration

C. of A.
Issued

Type and Remarks

Australian civil conversions (with Royal Australian Air Force serials where applicable)

<i>A6-5</i>	<i>G-AUEG</i>	8. 8.24	D.H.9	} Civil Aviation Branch, Melbourne. Temporary mail flights. Returned to R.A.A.F. 18.12.24
<i>A6-4</i>	<i>G-AUEH</i>	2. 9.24	D.H.9	
Not given	<i>G-AUEU</i>	29. 6.25	D.H.9: H. C. Miller, Adelaide, crashed at Port Pirie, S.A., 16.3.28	
Not given	<i>G-AUFB</i>	24. 9.26	D.H.9: Courier Aircraft Ltd., Brisbane; crashed at Wau, N.G., 3.3.28	
<i>H9340</i>	<i>G-AUFS</i>	31. 3.27	D.H.9: Bulolo Goldfields Aero Service "The Lachlun"; struck off register 10.34	
Not given	<i>G-AUHT</i>	14. 8.28	D.H.9: MacRobertson Miller Aviation Co., Adelaide, S.A., struck off register 9.37	
Not given	<i>G-AUKI</i>	Nil	D.H.9C: R. J. Parer, crashed at Port Moresby, N.G., 13.7.29	
<i>D3017</i>	<i>VH-UMB</i>	17. 9.29	D.H.9: Australian Aero Club, Melbourne; ex <i>A6-11</i>	
<i>A6-21</i>	<i>VH-UML</i>	11.11.29	D.H.9: "Albatross", Australian Aero Club, crashed at Archerfield, Q., 24.7.32	
<i>A6-19</i>	<i>VH-UMM</i>	20. 6.30	D.H.9: Aero Club of South Australia, Adelaide, struck off register 9.33	
<i>A6-9</i>	<i>VH-UMT</i>	31.10.29	D.H.9: Aero Club of N.S.W., dismantled 1930	

Beardmore Reserve Flying School, Renfrew

<i>H5632</i>	<i>G-EBGQ</i>	7. 7.23	2 seat trainer: crashed 30.10.24
<i>H9203</i>	<i>G-EBHP</i>	19. 9.23	2 seat trainer: written off in 1926
<i>H5886</i>	<i>G-EBIG</i>	25.10.23	Two seat trainer: to D.H.9C in 1929

Constructor's No.
(or R.A.F. Serial)
and Registration

C. of A.
Issued

Type and Remarks

Blake, Major W. T. (for round-the-world flight)

<i>H5652</i>	<i>G-EBDE</i>	Nil	Abandoned at Istres, France 28.5.22
<i>H5738</i>	<i>G-EBDF</i>	4. 7.23	To Laurentide Air Service 1.25 as <i>G-CAEU</i>
<i>H5678</i>	<i>G-EBDL</i>	Nil	Flown to Calcutta as ' <i>G-EBDE</i> ', presented to University of Benares

Det Danske Luftfartselskab (Danish Air Transport Co.)

<i>H9274</i>	<i>T-DOBC</i>	7. 8.20	4 seater: delivered Copenhagen 9.8.20, crashed at Solbjerg 17.10.21
<i>H9359</i>	<i>T-DOGH</i>	—	4 seater: delivered Copenhagen 17.8.20, became <i>OY-DIC</i> in 1929, crashed at Dybvad 18.8.30
<i>H5521</i>	<i>T-DODF</i>	—	4 seater: delivered Copenhagen 16.8.20, to spares 1929
<i>H9243</i>	<i>T-DOKL</i>	15. 9.20	4 seater: formerly <i>G-EAVM</i> , delivered Copenhagen 18.9.20, to spares 1927

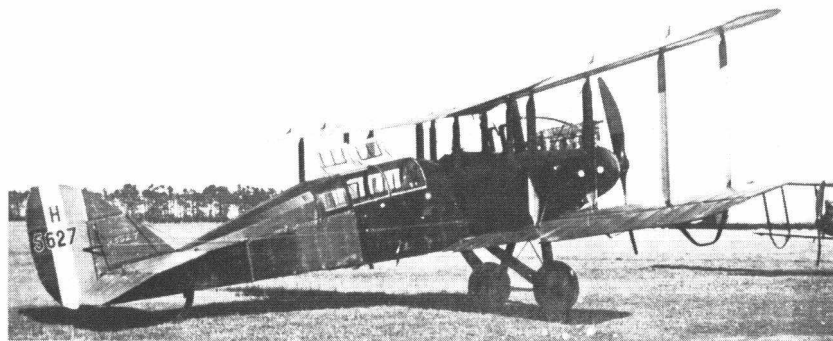
de Havilland civil production

11	<i>M-AAAG</i>	—	D.H.9C: delivered 19.9.21 Croydon	} to Española del Trafico Aero, Spain
12	<i>M-AAGA</i>	—	D.H.9C: delivered 19.9.21 Croydon	
13	<i>M-AGAA</i>	—	D.H.9C: delivered 7.10.21 Croydon	
14	<i>G-EAYT</i>	13. 1.22	D.H.9C*: D.H. Hire Service "Atlanta", lost at sea, Venice 2.10.22	
15	<i>G-EAYU</i>	10. 1.22	D.H.9C*: D.H. Hire Service, sold in the Hedjaz 11.24	
16	<i>G-EAXG</i>	5. 9.21	D.H.9C: delivered 11.1.22, D.H. Hire Service, to K.L.M. 6.22	
25	<i>G-EBAW</i>	10. 3.22	D.H.9C: D.H. Hire Service, crashed 10.9.23	
26	<i>G-EBAX</i>	6. 3.22	D.H.9C*: D.H. Hire Service, written off 23.4.24	
38	<i>G-EBCZ</i>	29. 5.22	D.H.9C*: D.H. Hire Service, crashed 7.11.23	
39	<i>G-EBDD</i>	16. 6.22	D.H.9C*: D.H. Hire Service, written off 6.11.25	
66	<i>G-EBEZ</i>	17. 2.26	2 seat trainer: converted to D.H.9J in 1926	
76	<i>G-EBFQ</i>	15. 5.23	2 seat trainer: converted to D.H.9J in 1926	
82	<i>G-EBGT</i>	2. 7.23	2 seat trainer: converted to D.H.9J in 1926	
83	<i>G-EBGU</i>	19. 9.23	D.H.9C: sold abroad 11.24	
86	<i>G-AUED</i>	24. 8.23	D.H.9C*: QANTAS, crashed at Tambo, V., 24.3.27	
87	<i>G-AUEF</i>	30. 8.23	D.H.9C*: QANTAS, damaged beyond repair landing at Cloncurry 22.9.26	
181	<i>G-EBLH</i>	27. 6.25	2 seat trainer: converted to D.H.9J in 1926	

Indian civil conversions

<i>H9129</i>	<i>G-IAAA</i>	—	} Irrawaddy Delta & Flotilla Co. Ltd., Rangoon; <i>G-IAAA</i> later <i>VT-AAP</i>
<i>D3180</i>	<i>G-IAAB</i>	—	
<i>E611</i>	<i>G-IAAQ</i>	—	} Indian Air Transport & Survey Ltd., initially floatplanes; later <i>VT-AAQ</i> and <i>VT-AAS</i>
<i>D5686</i>	<i>G-IAAS</i>	—	
—	<i>G-IAAY</i>	—	E. A. Alton, Bombay; later <i>VT-AAO</i>

* Full swept wing conversion.



D.H.9 H5627/G-NZAE, locally modified in New Zealand to seat two passengers in a small cabin, was used by the Canterbury Aviation Co. on the Christchurch-Blenheim mail service in 1922.

Constructor's No.
(or R.A.F. Serial)
and Registration

C. of A.
Issued

Type and Remarks

Handley Page Ltd. (disposal stock, including aircraft used by Handley Page Transport Ltd.)

H9271	G-EATA	14. 5.20	D.H.9B: sold abroad 4.21
H9282	G-EAUC	6. 7.20	D.H.9B: scrapped 1922
H9196	G-EAUH	24. 7.20	D.H.9B: to K.L.M. 7.21 as H-NABP
H9197	G-EAUI	13. 7.20	D.H.9B: for Surrey Flying Services Ltd.
H9128	G-EAUN	18. 8.20	D.H.9B: to Cia Española del Trafico Aero 6.23 as M-AGAG
H9187	G-EAUO	20. 8.20	D.H.9B: to K.L.M. 7.21 as H-NABO
H9176	G-EAUP	8. 9.20	D.H.9B: scrapped 1920
H9125	G-EAUQ	31. 7.20	D.H.9B: scrapped 1921
H5646	Nil	31. 7.20	D.H.9: exported
H9246	Nil	18. 8.20	D.H.9: exported
H9272	Nil	18. 8.20	D.H.9: exported

New Zealand operators

H5636	G-NZAD	—	Canterbury Aviation Co., to N.Z.A.F. 1924 as 5636
H5627	G-NZAE	—	Canterbury Aviation Co.
D3136	G-NZAH	—	Canterbury Aviation Co., sold to M. W. Buckley, named "Firefly" and wrecked at Wairarapa in 1922
D3139	G-NZAM	—	New Zealand Aero Transport Co., airscrew now in Auckland Museum
H5672	G-NZAQ	—	New Zealand Aero Transport Co.
H5609	—	—	New Zealand Aero Transport Co.

Northern Air Lines, Alexandra Park, Manchester (later Barton)

**H4890	G-EBDG	27. 7.23	D.H.9C*: scrapped in 1930
H5886	G-EBIG	25.10.23	D.H.9C*: dismantled in 1931
H9333	G-EBJW	30. 8.24	3 seater: sold to Air Taxis Ltd., Stag Lane
H9147	G-EBJX	17. 9.24	3 seater: sold to Air Taxis Ltd., Stag Lane

Constructor's No.
(or R.A.F. Serial)
and Registration

C. of A.
Issued

Type and Remarks

QANTAS

Not given G-AUFM 12. 2.27 D.H.9C*: "Ion", dismantled at Longreach 1.29

* Full swept wing conversion.

** As documented.

SNETA

H9370	O-BATA	—	D.H.9C: to the United Kingdom as G-EBUM, C. of A. issued 22.12.27; sold in India 1.29 as VT-AAK
Not given	O-BATE	—	D.H.9: destroyed at Le Bourget 13.4.21
F1148	O-BEAU	—	D.H.9: crashed in Switzerland 5.10.25
F1221	O-BLAC	—	D.H.9: withdrawn from use 12.21
F1223	O-BELG	—	D.H.9C: to the United Kingdom as G-EBUN, C. of A. issued 22.12.27; sold in India 1.29 as VT-AAL
F1293	O-BIEN	—	D.H.9: later with cabin top, became OO-IEN, withdrawn from use 2.31

Surrey Flying Services Ltd.

H9248	G-AACP	28. 2.29	3 seater: to Aerial Sites Ltd. 6.36
H9324	G-AACR	22. 6.32	3 seater: to National Aviation Day Ltd., 6.32, used by Flight Refuelling Ltd. in 1934
H9327	G-AACS	Nil	3 seater: conversion abandoned
Not given	G-AADU	13. 7.29	3 seater: Surrey Flying Services Ltd.



Aerial Sites Ltd.'s three seat, banner-towing D.H.9, G-AACP, at the company's Hanworth base in 1936. (E. J. Riding Photo.)



D.H.9J *G-EBGT*, c/n 82, of the de Havilland School of Flying showing the 385 h.p. Armstrong Siddeley Jaguar III radial and rubber-in-compression undercarriage.
(Photo courtesy of John Cope.)

De Havilland D.H.9J

The de Havilland School of Flying began training R.A.F. reservists at Stag Lane on April 1, 1923 using Avro 548s and the Hire Service D.H.9s. These remained in use until 1926, the year in which primary training was transferred to Cirrus Moths. The veteran D.H.9s, including the antique *G-EAAC*, were then modernised for advanced instruction and given red fuselages with metallic gold flying surfaces. In this form they were known as the D.H.9J, the ultimate variant, with shortened and strengthened front fuselages to carry the heavier 385 h.p. Armstrong Siddeley Jaguar III fourteen cylinder, two row, radial engine, behind which metal inspection doors gave access to the ancillary equipment. The old rigid V strut undercarriage, sprung like the D.H.4 of long ago, by four 6 ft. 9 in. rubber bungees, each wound nine times round the axle, gave place to new D.H. rubber-in-compression units. Aileron circuits were also modified to incorporate the patent D.H. differential gear and Handley Page slots were fitted. An age-old problem which had dogged many First World War aircraft, was at last solved by fitting a gravity tank in the centre section to be switched on during the approach when the air driven pumps were working too slowly to give an adequate fuel supply. The pupil normally occupied the front cockpit, with the instructor in the rear, making it necessary to carry an equivalent weight of ballast when flying solo. In practice it was found that the average pupil with only 10 hours on Cirrus Moths needed but 20 minutes dual before going solo in the larger and heavier D.H.9J.

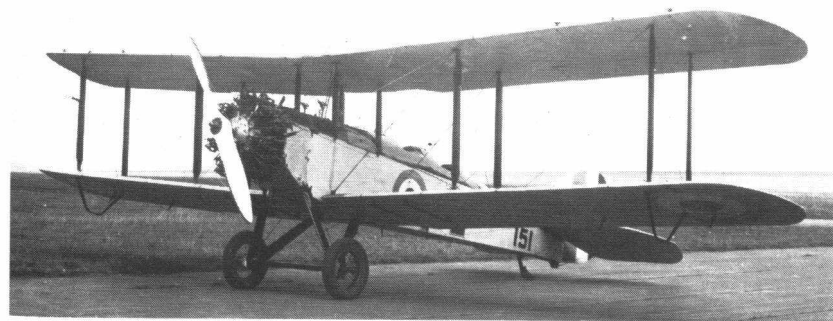
As the powerful Jaguar engine imparted a somewhat lively performance to the traditionally sedate D.H.9, it was necessary to fit a throttle stop to

prevent the use of full power. Many of these engines already had upwards of 4,000 flying hours to their credit, having been purchased secondhand from Imperial Airways Ltd. after their removal from A.W. Argosy I passenger aircraft. Three of these engines were collected from Lympe in a seized up condition but they too were successfully overhauled at Stag Lane and gave long years of trouble free service in the D.H.9Js.

The Armstrong Whitworth Reserve School at Whitley also re-equipped with D.H.9Js, two being erected at Stag Lane in 1926 and a further three in 1929, one of which *G-AARS*, was used temporarily as a flying testbed for the Armstrong Siddeley Serval IV nine cylinder radial engine. When Air Service Training Ltd. was formed in 1931, all three went to Hamble where their black fuselages and silver wings were a familiar sight until 1936. Two other replacement aircraft were also built at Stag Lane for the de Havilland School of Flying Ltd., one in 1927 and the other in 1929. In common with those built for Armstrong Whitworth, they had plywood covered fuselages.



Development flying of the 340 h.p. Armstrong Siddeley Serval IV radial was done with D.H.9J *G-AARS* of the Armstrong Whitworth Reserve School, Whitley. (Westland Photo.)



A number of D.H.9s were fitted with Jaguar engines and D.H.50 centre section tanks by the South African Air Force but they did not have the airframe improvements of the British D.H.9J. (S.A.A.F.)



The ancient D.H.9J, G-EAAC, in its Moth support role during the 1929 King's Cup Race.
(D. L. Brown Photo.)

G-EAAC, the veteran D.H.9J which the de Havilland company had preserved so immaculately for so long, acted as a flying workshop for the horde of Moths competing in the 1929 King's Cup Race. Loaded with tools and spares, and piloted by C. A. Pike it landed at Mousehold, Lympe, Hamble, Whitchurch, Blackpool, Renfrew, Cramlington, Sherburn, Castle Bromwich and Heston—ever in the wake of the competitors but seldom needed.

The last D.H.9J was not completed until the autumn of 1931, not long before the type went out of service. This machine, G-ABPG, built as an exercise by senior students of the Aeronautical Technical School, was fitted with an Armstrong Siddeley Jaguar IVC and employed on normal training duties by the Flying School. This had by this time been transferred to Hatfield, and 'PG' was almost certainly the sole D.H.9 of non-military origin.

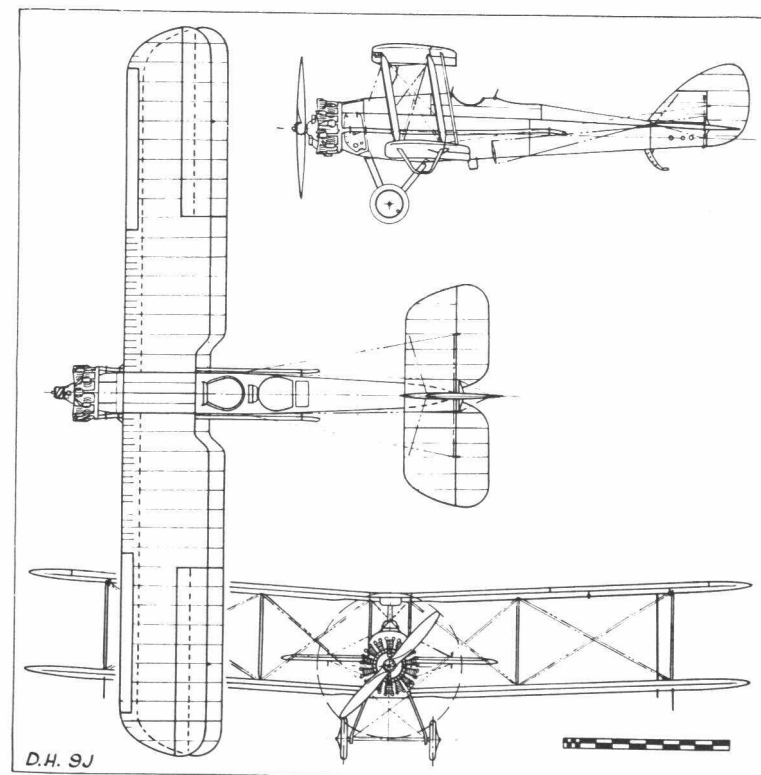
SPECIFICATION AND DATA

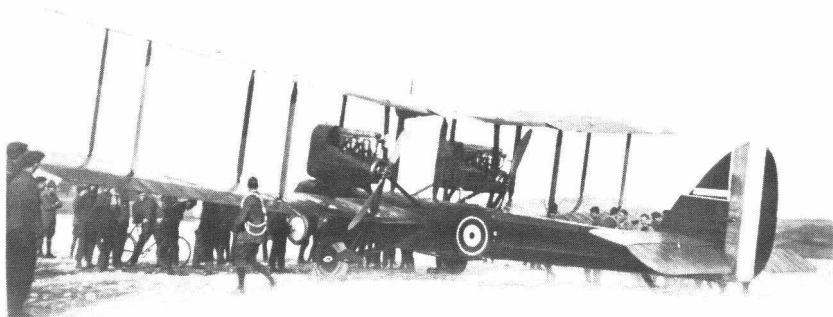
Manufacturers:	The de Havilland Aircraft Co. Ltd., Stag Lane Aerodrome, Edgware, Middlesex	
	The de Havilland Aeronautical Technical School, Hatfield, Herts.	
Power Plant:	One 385 h.p. Armstrong Siddeley Jaguar III One 500 h.p. Armstrong Siddeley Jaguar IVC One 340 h.p. Armstrong Siddeley Serval IV	
Dimensions:	Span 42 ft. 4½ in.	Length 28 ft. 9 in.
	Height 11 ft. 2 in.	Wing area 434 sq. ft.
Weights:	(G-EAAC) Tare weight 2,452 lb. All-up weight 3,725 lb. (G-EBGT) Tare weight 2,375 lb. All-up weight 3,900 lb.	
Performance:	Maximum speed 100 m.p.h.	Cruising speed 80 m.p.h.
	Stalling speed 48 m.p.h.	Climb to 10,000 ft. 9 min.
	Ceiling 25,000 ft.	Range 390 miles

Individual Histories:

Constructor's No. and Registration	C. of A. as 9J	Remarks
H9277* G-EAAC	8. 7.26	Formerly D.H.9B K-109; scrapped 1933
66 G-EBEZ	17.12.26	Fitted with Lion in 1923; scrapped 1933
76 G-EBFQ	11.12.26	Built as Puma trainer; scrapped 1933
82 G-EBGT	19. 8.26	Crashed at Hatfield 16.10.32
H5844* G-EBHV	29. 9.27	Built as Puma trainer; scrapped 10.28
181 G-EBLH	25. 8.26	Crashed at White Waltham 12.5.27
282 G-EBOQ	17. 8.26	A.W. Reserve School; scrapped 10.29
283 G-EBOR	15. 9.26	A.W. Reserve School; scrapped 1.29
326 G-EBTN	14. 9.27	D.H. Reserve School; scrapped 1933
397 G-AARR	4.10.29	Air Service Training Ltd.; scrapped 1936
398 G-AARS	17.10.29	Air Service Training Ltd.; crashed 10.34
399 G-AART	5.11.29	Air Service Training Ltd.; scrapped 1936
704 G-AASC	20.12.29	D.H. Reserve School; scrapped 1931
1990 G-ABPG	14.10.31	D.H. Reserve School; scrapped 1933

* R.A.F. serial of military original.





The first prototype D.H.10 with two 230 h.p. B.H.P. engines arranged as pushers. The cutaway mainplane trailing edge was unique to this aircraft.

De Havilland D.H.10 Amiens

German bombing successes in 1917 over London, the Home Counties and along the East Coast, using twin engined aircraft, forced the Air Board to take retaliatory action and to renew its interest in the D.H.3. A contract was therefore placed with the Aircraft Manufacturing Co. Ltd. for prototypes of a somewhat larger version designated the D.H.10. The aircraft was structurally similar to its predecessor, the airframe being of spruce and ash construction, with fabric covered mainplanes. The fuselage consisted of a plywood covered, box-like front portion to which was bolted the usual Warren girder tail section. Rudder and elevator trailing edges were of steel tubing to simplify the creation of artistic outline and to reduce the risk of accidental damage on the ground. Steel tubing was also used for the wide track, divided undercarriage and for engine nacelle struts, the latter being faired to streamline shape with fabric doped over wooden formers. Two 230 h.p. B.H.P. watercooled engines were mounted as pushers and to give adequate airscrew clearance cut outs were made in the trailing edges of upper and lower mainplanes as on the D.H.3A. The crew of three comprised front and rear gunners and pilot, but full dual control was fitted in the rear gunner's cockpit, the rudder bar being covered by hinged floorboards when not in use.

The prototype D.H.10 C4283, flew for the first time on March 4, 1918, but its performance was 6% down on estimate and it could carry only a small military load. The third and fourth prototypes were therefore fitted with more powerful engines arranged to drive tractor instead of pusher airscrews, the third, C8659, flying for the first time on April 20, 1918, with 360 h.p. Rolls-Royce Eagle VIIIs. The first two prototypes were therefore the only D.H.10s to have the cut out trailing edges. Engines of even greater power—400 h.p. Liberty 12s—were fitted to the fourth prototype C8660,

which was the true pre-production version without nose wheels. It was built with $2\frac{1}{2}$ instead of 4 degrees of mainplane sweepback, elongated nacelles, Scarff rings for front and rear gunners and horn balanced ailerons. Fuel was carried in the front fuselage in two 98 gallon tanks, between which was a bay accommodating some 900 lb. of bombs. Additional bomb loads were carried on external racks under the lower mainplane.

When the prototypes were ordered, the Air Board gave the D.H.10 the type name Amiens, so that the first two prototypes were Amiens Mk. I, the third Mk. II, while the fourth and all production aircraft were Amiens Mk. III. Due no doubt to the rapid winding up of production at the end of the war, this type name was little used and its very existence lay forgotten in official files for close on 40 years. Although orders were placed with the parent company and six sub-contractors for 1,295 D.H.10s, only eight were on R.A.F. charge at the end of hostilities. Thus a most promising



C8659. the third prototype D.H.10, with 360 h.p. Rolls-Royce Eagle VIII engines. (De Havilland Photo.)



The D.H.10C prototype E5557 which took part in local races at Hendon in the summer of 1919 and later flew mails for Aircraft Transport and Travel Ltd. (Imperial War Museum Photo Q.65514.)

and worthy successor to the immortal D.H.4 arrived too late to see active war service, and the subsequent history of the type was one of technical refinement and mail carrying. Improvement in performance by mounting the engines directly on the lower mainplane in order to eliminate the enormous parasitic drag of the original strutted arrangement, gave rise to the Mann, Egerton-built D.H.10A Amiens Mk. IIIA with Liberty engines. These were given an appreciable degree of upthrust and the aircraft was also equipped with heavy duty wheels. When Liberty deliveries ceased at the end of 1918 an up-rated Rolls-Royce Eagle VIII of 375 h.p. became the standard engine of a final version known as the D.H.10C Amiens Mk. IIIC.

The first major experimental modification to the D.H.10 was the installation of a 1½ pounder Coventry Ordnance Works quick firing gun in D.H.10 *E5458* and D.H.10C *E5550* for trials at Orfordness. Each had an enlarged bow cockpit and the old familiar nose wheels but trials were discontinued when air firing tests resulted in the crash of *E5458*.

The third investigation was devoted to improving asymmetrical flying in the event of engine failure and a production D.H.10 *E6042* was modified by Airco and tested at Farnborough in 1921 with twin fins and rudders of typical D.H. outline. A rectangular central fin was next added for comparison and in 1922 the entire assembly was replaced by an experimental tail unit with an immense horn balanced single rudder 39 sq. ft. in area as compared with the usual 25 sq. ft. In 1923 the aircraft was flown with twin rectangular rudders and between April 29, 1924 and May 22, 1926, fifteen or twenty test flights were made with the standard D.H.10 rudder equipped with a small servo rudder on outriggers.

In the peacetime R.A.F. the D.H.10 was used by No. 120 Squadron for the air mail service to the British Army of Occupation on the Rhine,



E6042, the experimental twin ruddered D.H.10 in its final configuration at Farnborough in 1923. (Crown Copyright reserved.)

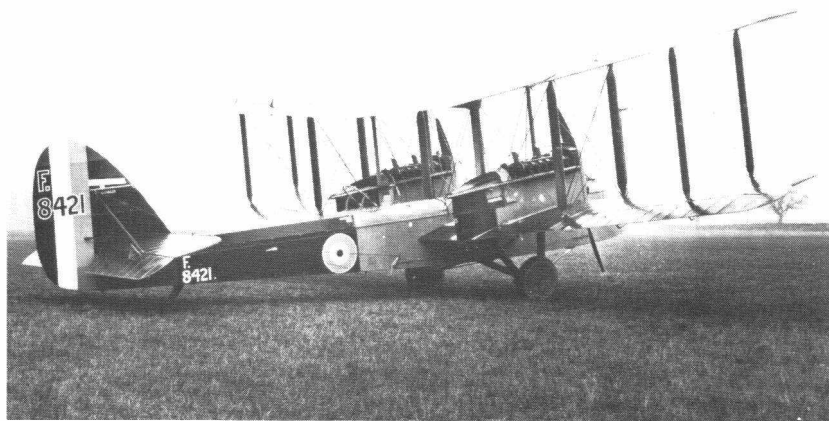
daily flights being made between Hawkinge and Cologne. A D.H.10 piloted by Capt. Barratt which left Hawkinge at 10.15 p.m. on May 14, 1919 and arrived at Cologne 3¼ hours later, was the first aircraft ever to carry mails at night. Most of the D.H.10s in India were sold as scrap at Ambala in February 1922 but a few were retained to police the North West Frontier with No. 97 Squadron and to carry the desert air mail between Cairo and Baghdad until superseded by Vickers Vimys in 1923. For this purpose they were fitted with an additional cockpit behind the pilot, e.g. *E5507*. One of the last recorded appearances of a D.H.10 was at the No. 7 Group Display, Andover on June 23, 1923 when F/O. J. S. Chick performed a dog fight with two S.E.5As.



The Liberty engined D.H.10 civil mailplane *G-EAJO* operated by Aircraft Transport and Travel Ltd. in 1919. ('Flight' Photo 483.)

The designation D.H.10B is generally supposed to have been reserved for a purely civil mail carrying version but only two aircraft were used for this purpose in England. Both were operated by Aircraft Transport and Travel Ltd. but neither was actually known as a D.H.10B because the first was the D.H.10C prototype *E5557* and the other a demilitarised D.H.10 *E5488*, civil registered as *G-EAJO*. The latter was granted a full civil C. of A. before demonstration at the ELTA Exhibition at Amsterdam in August 1919 by Capt. Gerald Gathergood and on September 30th joined *E5557* on regular mail flights between Hendon, Newcastle and Renfrew in an attempt to break the railway strike. A scheme was also considered for a conversion to carry pilot and four passengers, two side by side in the nose and two in the rear, the starboard passengers facing aft and the port forward.

At least one D.H.10 supplemented the DH-4s on United States air mail routes. Powered by two Liberty VI engines and numbered *111*, it had completed 31 hours 27 minutes flying on the New York–Cleveland–Omaha route by June 1920, average flying time for the initial stage of 200 miles being 3 hours.



F8421, first D.H.10 of a batch of 75 ordered from Mann, Egerton and Co. Ltd., Norwich.
(Imperial War Museum Photo Q.67976.)

SPECIFICATION AND DATA

Manufacturers: The Aircraft Manufacturing Co. Ltd., Hendon, London, N.W.9
The Alliance Aeroplane Co. Ltd., Cambridge Road, London, W.14
The Birmingham Carriage Co., Birmingham
The Daimler Co. Ltd., Coventry
Mann, Egerton and Co. Ltd., Aylsham Road, Norwich, Norfolk
National Aircraft Factory No. 2, Heaton Chapel, Stockport
The Siddeley-Deasy Motor Car Co. Ltd., Parkside, Coventry

Power Plants: (D.H.10 Amiens Mk. I) Two 230 h.p. B.H.P.
(D.H.10 Amiens Mk. II) Two 360 h.p. Rolls-Royce Eagle VIII
(D.H.10 Amiens Mk. III) Two 400 h.p. Liberty 12
(D.H.10A Amiens Mk. IIIA) Two 400 h.p. Liberty 12
(D.H.10C Amiens Mk. IIIC) Two 375 h.p. Rolls-Royce Eagle VIII

Dimensions, Weights and Performances:

	Mk. I	Mk. II	Mk. III	Mk. IIIA
Span . . .	62 ft. 9 in.	62 ft. 9 in.	65 ft. 6 in.	65 ft. 6 in.
Length . . .	38 ft. 10 in.	38 ft. 10 in.	39 ft. 7½ in.	39 ft. 7½ in.
Height . . .	14 ft. 6 in.	14 ft. 6 in.	14 ft. 6 in.	14 ft. 6 in.
Wing area . . .	789½ sq. ft.	834½ sq. ft.	837½ sq. ft.	837½ sq. ft.
Tare weight . . .	5,004 lb.	—	5,585 lb.	5,750 lb.
All-up weight . . .	6,950 lb.	8,500 lb.	9,000 lb.	9,000 lb.
Maximum speed . . .	109 m.p.h.	117½ m.p.h.	—	129 m.p.h.
Climb to 6,500 ft. . .	11 min. 25 sec.	—	9 min.	7 min.
Service ceiling . . .	15,000 ft.	—	16,500 ft.	17,500 ft.
Endurance . . .	3½ hours	—	5¼ hours	5¼ hours

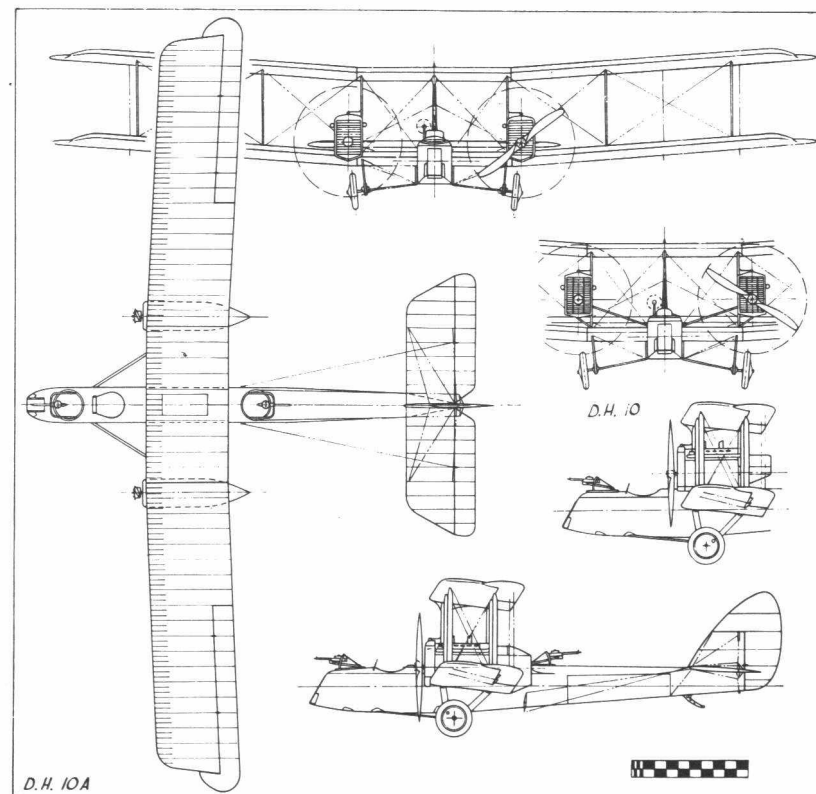
Production: The following serial numbers were allotted to D.H.10s but many were not completed.

Serial range	Manufacturer	Serial range	Manufacturer
C8658 to C8660	Airco	*F351 to F550	N.A.F. 2
E5437 to E5636	Airco	F1867 to F1882	Airco
E6037 to E6136	Birmingham Carriage Co.	F7147 to F7346	Alliance
E7837 to E7986	Siddeley-Deasy	F8421 to F8495	Mann, Egerton
E9057 to E9206	Daimler	H2746 to H2945	Airco

* Believed F351 to F355 only. F352 crashed 2.19.

Service Use: (a) In the United Kingdom Nos. 104 and 120 Squadrons. (b) On the N.W. Frontier of India No. 60 (formerly No. 97) Squadron. (c) In Egypt No. 216 Squadron.

Civil Conversions: G-EAJO, formerly E5488, C. of A. issued 18.8.19, crashed 4.20; at least No. 111 in America.



D.H. 10A



The prototype D.H.11 Oxford. (Airco Photo.)

De Havilland D.H.11 Oxford

Although the D.H.11 long distance day bomber was intended as a D.H.10 replacement and retained the twin engined, three bay layout of the earlier type, it would be difficult to visualise two more dissimilar aeroplanes. They were structurally identical having fabric covered, wooden airframes incorporating steel tubing for highly stressed or vulnerable members such as engine mountings, undercarriage and the empennage trailing edges. Both types also had horn balanced ailerons and the characteristic de Havilland rudder, but there the similarity ended. Four degrees of dihedral on the upper mainplane compared with two degrees on the lower, gave the wings of the D.H.11 a diverging appearance and the fuselage filled the whole mainplane gap, making it possible to put the rear gunner on a raised floor in the mid upper position with a commanding field of fire in all upward directions.

A fuselage 6 ft. 0 in. deep and 4 ft. 0 in. wide enabled main fuel tanks of 170 gallons capacity to be slung from the top longerons of the centre fuselage with a walk way beneath. This gave the rear gunner access to the cockpit, in which the pilot sat on the starboard side, and thence to the front gunner. Entry to the aircraft was gained through a trap door between the spars of the lower wing which opened on to this catwalk. Armament consisted of a Scarff-ring-mounted Lewis gun fore and aft and approximately 1,000 lb. of bombs carried internally. Two 320 h.p. A.B.C. Dragonfly radial engines were housed in nacelles fixed directly to the lower mainplane but the eminently business-like and efficient divided undercarriage of the D.H.10 gave place to a narrow track, cross-axle unit resembling that of a scaled up D.H.9A.

Designs began early in 1918 when a Contract was placed for three aircraft and by August the fuselage of the prototype, *H5891*, was well advanced in the Hendon factory. In September all work ceased because the Dragonfly engines were beset by problems and in November Siddeley Puma in-line, high compression engines were considered and the necessary engine bearer modifications were put in hand.

By March 1919 the machine was ready and the mainplanes were being covered yet despite recurring magneto trouble it was decided to fit the Dragonflies after all. After the first few flights *H5891* went back into the works for the engines to be repositioned but was short lived. Its last flight came when a connecting rod broke in one of the engines, which seized up just as the aircraft became airborne, but the pilot, F. T. Courtney, made a masterly forced landing without damage.

SPECIFICATION AND DATA

Manufacturers: The Aircraft Manufacturing Co. Ltd. Hendon, London, N.W.9.

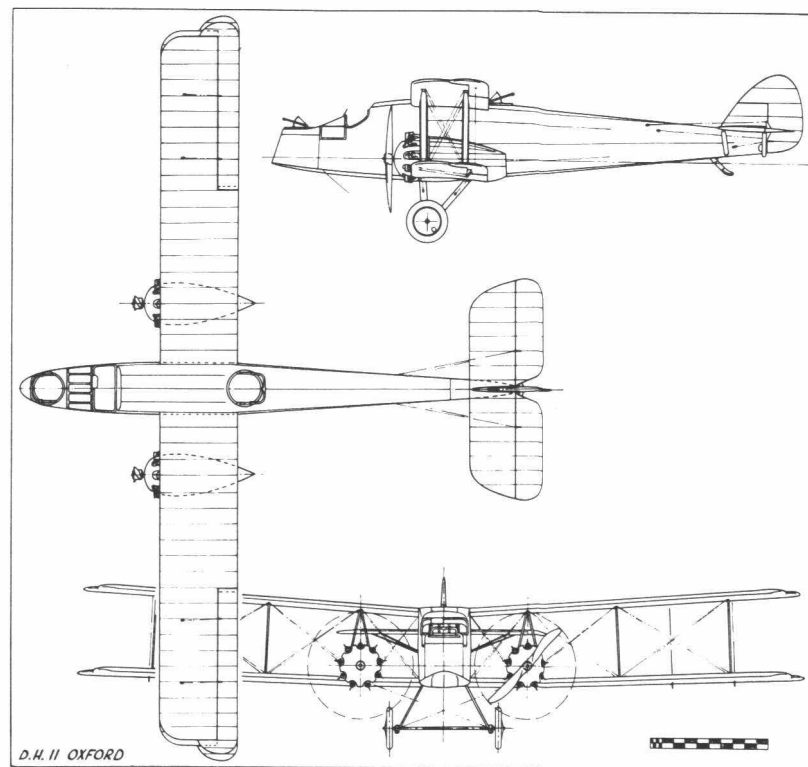
Power Plants: (Mk. I) Two 320 h.p. A.B.C. Dragonfly
(Mk. II) Two 290 h.p. Siddeley Puma h.c.

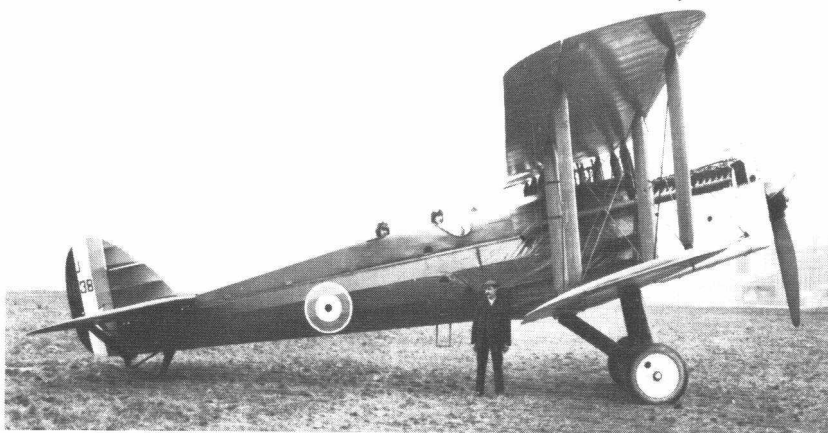
Dimensions: Span 60 ft. 2 in. Length 45 ft. 2½ in.
Height 13 ft. 6 in. Wing area 719 sq. ft.

Weights: Tare weight 3,795 lb. All-up weight 7,027 lb

Estimated Performance: Maximum speed at 6,500 ft. 117 m.p.h.
Climb to 10,000 ft. 13½ min. Endurance 3¼ hours

Production: Prototype only, *H5891*, to Contract 35a/2150/C.2485. Projected Mk. IIs, *H5892* and *H5893*, with Puma high compression engines, were not built. Serials later allotted to Sopwith Buffaloes.





D.H.14 Okapi J1938, c/n E.44, with 525 h.p. Rolls-Royce Condor I. (*Imperial War Museum Photo MH.3554.*)

De Havilland D.H.14 Okapi

The D.H.14 was an extremely large single engined, two seat biplane of conventional appearance designed in 1918 as a replacement for the D.H.4, D.H.9 and D.H.9A. Its performance and military potential were such that had the war lasted, Berlin would have suffered considerable damage at the hands of D.H.14 crews. Although too late for the war, the D.H.14 contract was not cancelled but construction was considerably delayed and in accordance with the system of aircraft nomenclature laid down in Technical Department Instruction No. 538, it was given the type name Okapi.

Since 1917 the Rolls-Royce company had been developing a 12 cylinder Vee-type watercooled engine similar to, but larger than, the Eagle. Fitted with four instead of two valves per cylinder, it gave 525 h.p. and was named the Condor. The D.H.14 was one of the first aircraft fitted with this engine which was cooled by a large nose radiator with controllable shutters.

Although externally similar to a D.H.9A and structurally orthodox, the design included several novel features and many detail differences. Fuel tanks of 178 gallons capacity were housed in the fuselage aft of a fireproof engine bulkhead and fuel starvation experienced at low air speeds when using wind driven pumps was eliminated by using gravity feed. The unusual depth of the fuselage made it possible to blank off the upper portion of the main tank as a gravity tank and to rely on wind driven pumps only in cruising flight. The pilot's synchronised Vickers gun was sited in a deep groove in the top decking, heavy gauge steel tubing was

used for the engine mounting, strengthening blocks of aluminium were inserted in the lower longerons at undercarriage attachment points and the bomb load was stowed internally. Six 112 lb. bombs were carried inside the lower wing between the spars and two in the fuselage under the pilot's seat, draughts being prevented by covering the bomb openings with brown paper. Bombs were released manually by the gunner whose cockpit was fitted with twin Lewis guns on a Scarff mounting. Risk of shooting away his own tailplane bracing was eliminated by suppressing the top wires in favour of four faired tubular struts underneath, the rear pair of which were hinged to the bottom of the tail trimming tube and controlled tailplane incidence. This somewhat vulnerable gear, first fitted to the D.H.11, was protected by an additional curved member aft of the main tail skid. The undercarriage consisted of the usual wooden Vee struts and was sprung by rubber cord wound round the axle.



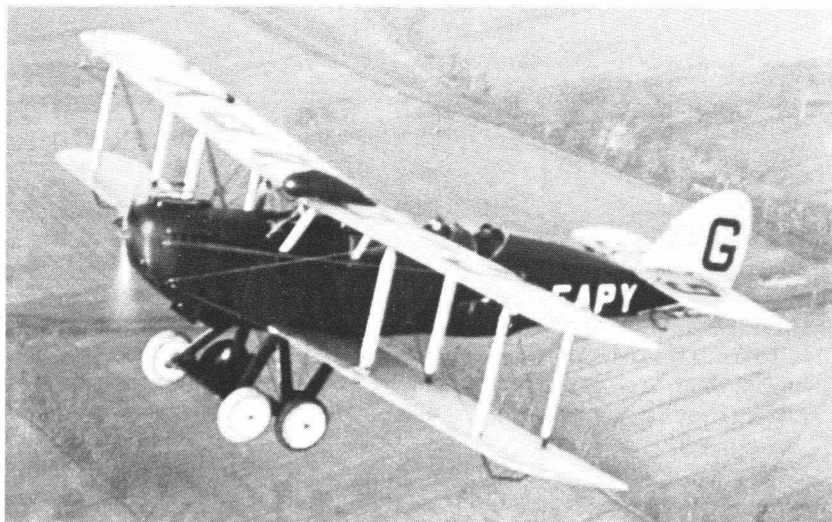
J1938, first D.H.14 in R.A.F. markings, at Martlesham Heath in March 1921. (*Imperial War Museum Photo Q.68929.*)



The long range Napier Lion engined D.H.14A G-EAPY, c/n E.46, in its original condition with two-wheeled undercarriage.

Three airframes were laid down but rigid postwar economies sounded the death knell of the D.H.14 and resulted in longevity for the D.H.9A. The first two aircraft, *J1938* and *J1939*, were well advanced by July 1919 but the third airframe was finished first—completed by Airco as the private venture D.H.14A for the *Daily Mail* transatlantic flight competition with Napier Lion and fuel capacity increased to 586 gallons. When the arrival in Ireland of Alcock and Brown ended the project, the D.H.14A stood in the Hendon works until first flown in the autumn of 1919 as F. S. Cotton's entry for the Australian Government England–Australia flight competition.

Ross and Keith Smith reached Darwin in their Vickers Vimy, *G-EAOU*, before Cotton was ready but Maj. Gen. Sefton Brancker, a director of Airco, then loaned him the aircraft for a flight to Cape Town. Registered *G-EAPY* and crewed by Cotton and Napier engineer W. A. Townsend, it left Hendon on February 4, 1920, immediately forced landed at



F. S. Cotton and W. A. Townsend taking off on their attempted London–Cape Town flight on February 2, 1920 and showing the special four-wheeled undercarriage.

Cricklewood with oil trouble but eventually reached Rome on February 21. Despite two additional wheels fitted forward of the main undercarriage, it turned over while landing on a beach 18 miles north east of Messina, Italy, on February 23 after failing to find the aerodrome.

G-EAPY was shipped back from Naples, rebuilt by Airco with three cockpits and sold to Cotton for the Aerial Derby of July 24, 1920. On the last leg of the race a petrol leak started a fire and the aircraft was badly damaged when it struck telephone cables in a forced landing near Hertford. The engine was salvaged and fitted to the Westland Limousine III, *G-EARV*, which Cotton took to Newfoundland later that year.



The D.H.14A at Hendon in July 1920 after its rebuild by Airco with a third cockpit.

When Airco closed down, the unfinished military D.H.14s were completed at Stag Lane by the de Havilland Aircraft Co. Ltd. *J1938*, flown in September 1920, went to Farnborough where, on December 22 Sqn. Ldr. Roderic Hill flew it on Condor engine trials. Except for brief visits to Martlesham on March 3 and 17, it spent the whole of 1921 at Farnborough, making occasional test flights which culminated in an endurance test on September 8 and rate of climb trials on November 24. It crashed at Burnham Beeches, Bucks. on February 10, 1922 while returning from Chingford, F/O Robinson and observer Mitchell being killed.

After Cotton's aircraft was repaired at Stag Lane it emerged as *J1940* and records show that test pilot H. 'Jerry' Shaw, with W. K. Mackenzie as observer, made unsticking trials there on March 13, 1921 at all-up weights between 6,400 lb. and 6,820 lb., the shortest take-off in a 12 knot wind being a mere 215 yards.

The second military machine, *J1939*, was delivered to Martlesham on April 14, 1921 but the D.H.14 remained on the Secret List and was not seen in public until one, probably *J1939*, was flown from Martlesham to Croydon by A. H. Orlebar for the Imperial Air Conference display of February 3–6, 1922.

SPECIFICATION AND DATA

Manufacturers: The Aircraft Manufacturing Co. Ltd., Hendon, London, N.W.9
Completed by the de Havilland Aircraft Co. Ltd., Stag Lane Aerodrome, Edgware, Middlesex

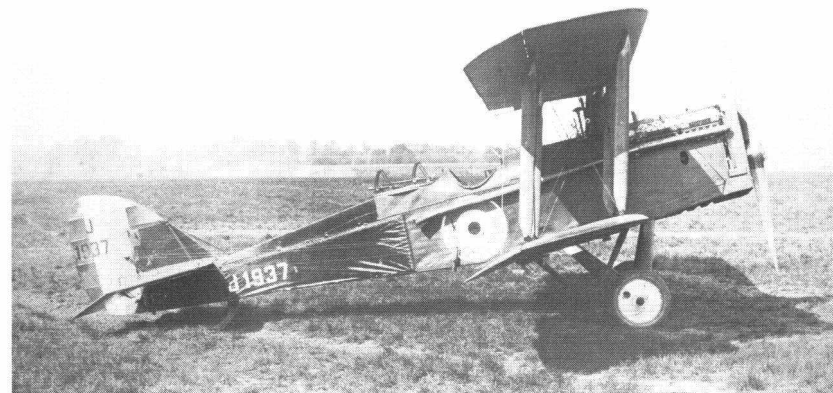
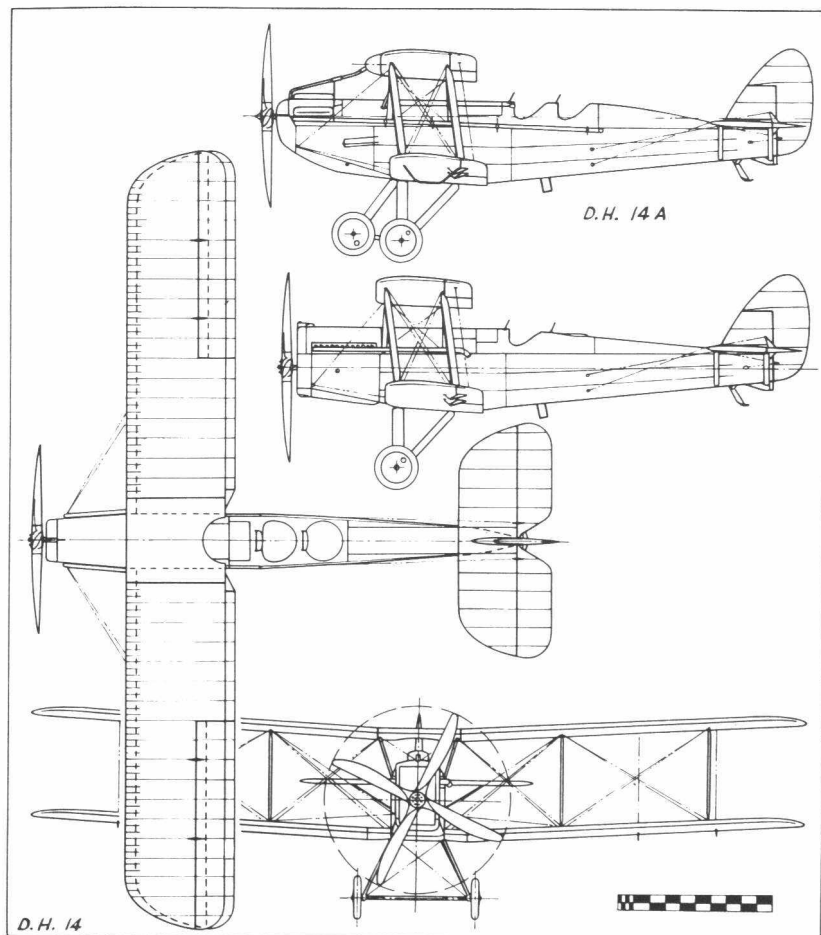
Power Plants: (D.H.14) One 525 h.p. Rolls-Royce Condor I
(D.H.14A) One 450 h.p. Napier Lion

Dimensions: Span 50 ft. 5 in. Length (D.H.14) 33 ft. 11½ in.
(D.H.14A) 37 ft. 7 in.
Height 14 ft. 0 in. Wing area 617 sq. ft.

Weights: (D.H.14) Tare weight 4,484 lb. All-up weight 7,074 lb.
(D.H.14A) Tare weight 4,006 lb.

Performance: (D.H.14) Maximum speed at 10,000 ft. 122 m.p.h.
Rate of climb at 10,000 ft. 400 ft./min.
(D.H.14A) Maximum speed 117 m.p.h.

Production: (D.H.14) J1938 c/n E.44, crashed at Burnham Beeches 10.2.22
J1939 c/n E.45, delivered to Martlesham 14.4.21
(D.H.14A) J1940/G-EAPY c/n E.46, registered to Airco 4.12.19, re-registered to F. S. Cotton 20.5.20, damaged at Hertford 24.7.20; repaired and flown as J1940; delivered to Air Ministry 16.4.21



Although two D.H.15 Gazelle aircraft were ordered, only the second, J1937, was completed.

De Havilland D.H.15 Gazelle

Although built purely for experimental purposes, the D.H.15 was allotted the type name Gazelle, a name which, like those of its predecessors, was little used. The aircraft was basically a D.H.9A, modified as a flying test bed for the 500 h.p. B.H.P. Atlantic twelve cylinder Vee watercooled engine, built by the Galloway Engineering Co. Ltd., and consisting of two 230 h.p. B.H.P. engines united on a common crankcase. Its installation in the D.H.15 called for a large frontal radiator similar to that used with the Liberty 12 engine, long exhaust pipes and vertical instead of raked front centre section struts as on the D.H.14. Standard D.H.9A armament was retained and comprised a synchronised forward firing Vickers gun on the port side and a Lewis gun on a Scarff ring on the rear cockpit. Two D.H.15s were ordered, only one of which was completed. This was actually J1937, the second aircraft, which in 1919–20 completed extensive flight testing of the Atlantic engine, piloted by Gerald Gathergood.

SPECIFICATION AND DATA

Manufacturer: The Aircraft Manufacturing Co. Ltd., Hendon, London, N.W.9

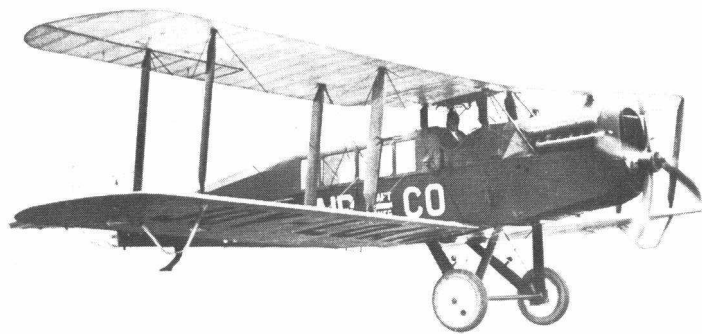
Power Plant: One 500 h.p. B.H.P. (Galloway Atlantic)

Dimensions: Span 45 ft. 11½ in. Length 29 ft. 11 in.
Wing area 486½ sq. ft.

Weights: Tare weight 2,312 lb. All-up weight 4,773 lb.

Performance: Maximum speed 139 m.p.h. Initial climb 1,500 ft./min.
Ceiling 20,000 ft.

Production: J1936 and J1937



K-130, first of Aircraft Transport and Travel Ltd.'s Eagle engined D.H.16s, making a 'Joy Loan' pleasure flight at Harrogate on June 9, 1919.

De Havilland D.H.16

Early in 1919 the Aircraft Manufacturing Co. Ltd. were already considering the type of aircraft best suited to the era of civil flying which lay ahead. Experience gained in converting the rear cockpit of the military D.H.4 into a cabin for two passengers and successful operation of the resultant D.H.4A by R.A.F. Communications Squadrons, undoubtedly influenced their decision to build a somewhat larger machine in the same configuration. The D.H.16, Airco's first purely civilian type, was consequently built from D.H.9A instead of D.H.4 components and the rear fuselage was widened to seat four passengers in facing pairs in a glazed cabin. Although powered by the 320 h.p. Rolls-Royce Eagle VIII engine of its predecessor, it was faster and carried four instead of two fare paying passengers, making it a considerably more economical and commercially attractive aircraft.

The prototype first flew at Hendon in March 1919 in contemporary khaki drab with red, white and blue rudder. In the following May it entered service with Aircraft Transport and Travel Ltd. bearing the temporary civil marking *K-130*. With 'Joy Loan' advertisements painted under the wings, it toured the provinces, visiting among other places Harrogate where pleasure flights were given on Whit Monday, June 9, 1919. Thus although the D.H.16 was inspired by the military D.H.4A, it antedated the entry into service of the first civil D.H.4A by two and a half months. In July 1919 the D.H.16 flew to Amsterdam where it was immaculately polished and shown without mainplanes on the Airco stand at ELTA, the First Air Traffic Exhibition. Bearing the nationality mark *G* on the rudder, the same aircraft, piloted by Major Cyril Patteson, was, on August 25th, used to fly the inaugural scheduled London—Paris service.



Passenger entry to the cabin of the D.H.16 was similar to that of the D.H.4A—via an external ladder and hinged roof.

Before production ceased in June 1920, nine D.H.16s had been constructed, one of which was experimentally fitted with air brakes and flaps. One was sold to the Sociedad Rio Platense de Aviacion (River Plate Aviation Co. Ltd.) at Buenos Aires for a highly successful cross river ferry to Montevideo but the remainder were used on the Continental services of Aircraft Transport and Travel Ltd. The final three were fitted with the heavier and more powerful Napier Lion engine and although in the opinion of some pilots the increase in wing loading made them tricky to handle, they set up new standards in reliability. During one week in the summer of 1920 the Lion engined D.H.16 *G-EAQS* made seven return trips between Croydon and Paris within six days, making fastest time of the week in each direction.



The D.H.16 *G-EALU* "Arras" with which Capt. H. 'Jerry' Shaw inaugurated the first K.L.M. Croydon—Amsterdam service on May 17, 1920.



The penultimate D.H.16 *G-EARU*, c/n P.59, showing the Napier Lion installation. (De Havilland Photo.)

In those days K.L.M., the Royal Dutch Air Line, had no aircraft of its own, so that the honour of making the first K.L.M. scheduled service between Croydon and Amsterdam fell to Capt. H. 'Jerry' Shaw and the Eagle powered D.H.16 *G-EALU* "Arras". This flight took place in extremely bad weather on May 17, 1920 and carried two British journalists, a bundle of English newspapers and a congratulatory letter from the Lord Mayor of London to the Burgomaster of Amsterdam, in a flight time of 135 minutes. K.L.M. schedules were thereafter all flown by Aircraft Transport and Travel Ltd., but when the firm closed down in December 1920, its aircraft, including seven surviving D.H.16s were stored in a Bessoneau hangar at Croydon, where all but two were broken up in 1922.

The exceptions, *G-EALM* and 'PT', were taken over by the de Havilland Aeroplane Hire Service in 1922 and after overhaul at Stag Lane went to Lympe for use on early morning newspaper flights to Ostend. A brisk business was also done in bringing back four casual passengers per trip at £3 a head. The D.H.16s were later based at Stag Lane, ready to go anywhere at £11 per hour.

On December 5, 1922 both D.H.16s took part in an early air freight experiment by flying consignments of a special Ulster edition of *The Times* from Sealand to Aldergrove on the day of issue, but after *G-EALM* crashed near Stag Lane during a test flight on January 10, 1923 with the loss of the pilot, R. E. Keyes, *G-EAPT* was dismantled and the type became extinct.

SPECIFICATION AND DATA

Manufacturers: The Aircraft Manufacturing Co. Ltd., Hendon, London, N.W.9

Power Plants: One 320 h.p. Rolls-Royce Eagle VIII
One 450 h.p. Napier Lion

Dimensions: Span 46 ft. 5 $\frac{1}{2}$ in. Length 31 ft. 9 in.
Height 11 ft. 4 in. Wing area 489 $\frac{1}{2}$ sq. ft.

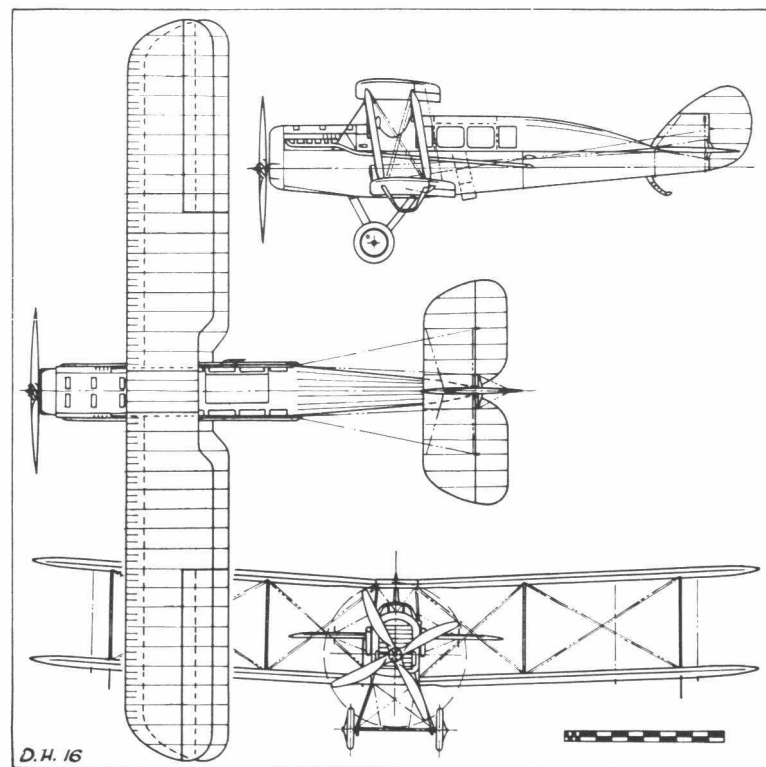
***Weights:** Tare weight 3,155 lb. All-up weight 4,750 lb.

***Performances:** Maximum speed 136 m.p.h. Cruising speed 100 m.p.h.
Initial climb 1,000 ft./min. Ceiling 21,000 ft.
Range 425 miles

* With Napier Lion engine.

Production:

	Constructor's No. and Registration	C. of A. Issued	Remarks
No. 1	K-130	25. 5.19	Later <i>G-EACT</i> , crashed 3.20
No. 4	G-EALM	9. 9.19	Crashed at Stanmore, Middlesex 10.1.23
P.1	G-EALU	22. 9.19	"Arras" to de Havillands 8.22
P.2	G-EAPM	28.11.19	"Agincourt" to de Havillands 7.23
P.3	G-EAPT	8.12.19	Dismantled by de Havillands 7.23
P.4	G-EAQG	24. 1.20	To the River Plate Aviation Company, Buenos Aires 4.20; later registered R-137
P.5E	G-EAQS	29. 3.20	Aircraft Transport and Travel Ltd., scrapped 1922
P.59	G-EARU	21. 5.20	
P.6	G-EASW	30. 6.20	





The Instone Air Line's veteran D.H.18A *G-EARO*, c/n 2, at Croydon in 1922. The stringers of the fabric covered fuselage are clearly visible. (Photo courtesy of L. T. Mason.)

De Havilland D.H.18

This was the first Airco machine designed from the outset as a commercial aeroplane and actually built, and its operating cost of 2s. 8d. per ton-mile was a remarkable reduction over those of its converted military predecessors. The D.H.18 was a two bay biplane of wooden construction accommodating eight passengers in an enclosed cabin amidships, with the pilot in an open cockpit behind. Power was provided by a 450 h.p. Napier Lion mounted high in the nose above a radiator compartment into which cooling air was admitted at the discretion of the pilot by means of controllable shutters. The rear fuselage was of standard de Havilland construction and consisted of a wire braced, wooden box girder but the cabin, a plywood covered wooden structure with a watertight door in case of forced landing at sea, was a revolutionary innovation. Two passengers sat with their backs to the engine bulkhead, two in the rear of the cabin and four sat in single seats amidships, those on the port side facing aft. Front and rear escape hatches were fitted in the cabin roof and a baggage compartment was provided under the pilot's cockpit. With seats removed, 256 cu. ft. of cabin space was available for the carriage of 2,200 lb. of freight at a slight overload which somewhat reduced the performance and raised the landing speed.

To ensure uninterrupted utilisation, the Lion engine was arranged as a power plant, the engine with its attendant water and oil tanks and the entire mounting being quickly detached for replacement by another. Fuel tanks of 104 gallons capacity were housed under the centre section in the curved decking of the cabin roof, giving a minimum range of 400 miles,

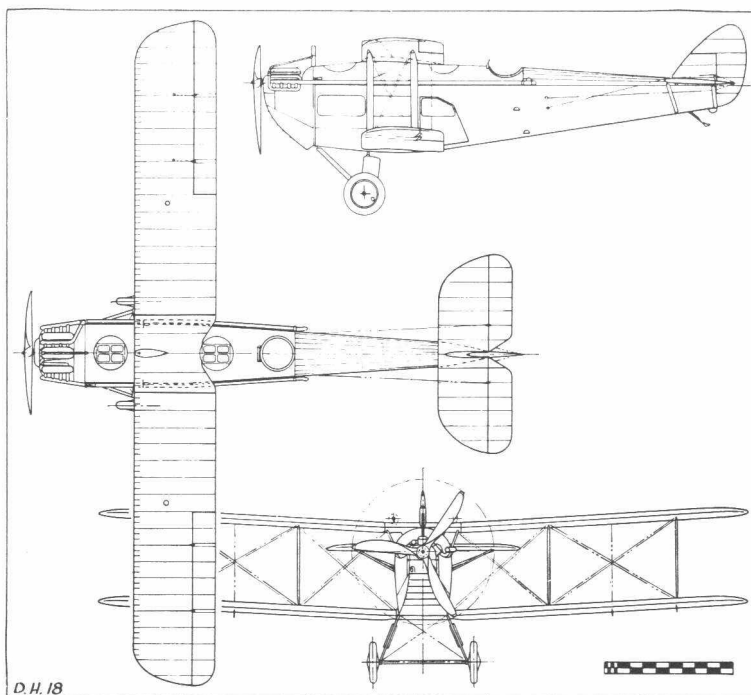
petrol being pumped initially to a streamlined gravity tank on top. An unusually tall undercarriage was fitted so that with the tail on the ground, the mainplanes were at an angle of attack of 17 degrees, enabling the machine to make really short landings. In a 5 m.p.h. wind the landing run was 163 yards. The traditional bungee shock absorbers gave place to an improved rubber cord system in a streamlined casing through which ran an oleo damping leg, enabling the halves of the undercarriage to move independently as much as 10 inches backwards and upwards on rough ground.

The prototype, *G-EARI*, built at Hendon at the beginning of 1920, was initially flight tested by F. T. Courtney and in March went to Martlesham for trials. The two bladed airscrew was then abandoned in favour of one with three blades and '*RI*' commenced service on the Croydon-Paris route of Aircraft Transport and Travel Ltd. on April 8th. It was wrecked in the following August when Cyril Holmes forced landed with engine trouble in some back gardens at Wallington, Surrey. Two others, designated D.H.18A, begun by Airco at Hendon, were the first aircraft completed by the infant de Havilland Aircraft Co. Ltd. at Stag Lane and embodied modifications resulting from flight experience with the prototype, including improved engine mountings, undercarriages and control cable fairleads.

When subsidised air services were authorised in March 1921, the Air Council was empowered to acquire up-to-date aircraft for lease to approved firms. The two D.H.18As, *G-EARO* and '*UF*' were therefore purchased and after the top centre sections had been strengthened with plywood, they were handed over to Instone Air Line, together with the fourth aircraft, *G-EAWO*, built to Air Council order. By the end of September 1921, '*RO*' had flown more miles on the Paris, Brussels and Cologne routes than any other aeroplane and it was considered expedient to withdraw it from service when the C. of A. expired two months later. This and the loss of '*UF*' in a crash, so reduced the Instone fleet that two replacement



D.H.18B *G-EAWX*, c/n 6, showing the plywood sided fuselage peculiar to this mark.



aircraft were supplied by the Air Council. Total D.H.18 production thus totalled six machines, the last two of which had plywood covering to the rear as well as to the front fuselage, additional emergency exits, improved cabin fittings and inertia engine starting under the designation D.H.18B. The first D.H.18B, *G-EAWW*, made its maiden trip from Croydon to Paris on December 18, 1921 piloted by F. T. Courtney and the other, *'WX*, fitted with a Leitner-Watts three bladed metal airscrew, went to Martlesham for type testing in January 1922 before delivery to Instone at Croydon a month later.

Pending delivery of its new D.H.34s, Daimler Hire Ltd. commenced a Croydon-Paris service on April 2, 1922 using the D.H.18A *'WO* transferred from Instone. Five days later it was in air collision in bad visibility with a Farman Goliath over Northern France, losing a wing and the tail unit to crash and burn with the loss of pilot R. E. Duke and a cabin boy. In the same month *'WX* was loaned to Handley Page Ltd. to alleviate its fleet shortage after which the two remaining aircraft of the type, *'RO* and *'WW*, were used almost exclusively on the Brussels route. When declared obsolete in 1923, *'RO* had flown 90,000 miles without mishap and together with *'WW* returned to the manufacturers for partial reconditioning for test purposes. On April 16, 1924 *'RO* was flown from Stag Lane to the R.A.E., Farnborough and there used on fuel consumption

tests from July 16th until December 5th, and for experiments in cabin silencing from February 3, 1925 until January 4, 1926. In July 1926 it was testing a drift sight for aerial photography; on July 7, 1927 it was flown to Biggin Hill. Its return flight to Farnborough on November 10th is believed to have been its last. *G-EAWW* was used by the Technical Dept. of the Air Ministry for a flotation test to determine the length of time an aircraft with that type of cabin would remain afloat after a forced landing at sea. With all loose equipment and cowlings removed and with the cabin sealed, it took off from Martlesham on May 2, 1924 piloted by Sqn. Ldr. C. A. Rea who shortly afterwards put the D.H.18B gently into the water off Felixstowe, where it floated for 25 minutes until a salvage crew recovered the engine.

SPECIFICATION AND DATA

<i>Manufacturers:</i>	The Aircraft Manufacturing Co. Ltd., Hendon, London, N.W.9 The de Havilland Aircraft Co. Ltd., Stag Lane Aerodrome, Edgware		
<i>Power Plant:</i>	One 450 h.p. Napier Lion		
<i>Dimensions:</i>	Span 51 ft. 2½ in.	Length 39 ft. 0 in.	
	Height 13 ft. 0 in.	Wing area 621½ sq. ft.	
<i>Weights:</i>	(D.H.18A) Tare weight 4,040 lb. All-up weight 6,516 lb. (D.H.18B) Tare weight 4,310 lb. All-up weight 7,116 lb.		
<i>Performance:</i>	(8 passengers) Maximum speed 128 m.p.h. Cruising speed 100 m.p.h. Initial climb 660 ft./min. Ceiling 16,000 ft. Range 400 miles (Freight) Maximum speed 124 m.p.h. Ceiling 15,000 ft.		

Production:

	Constructor's No. and Registration	C. of A. Issued	Remarks
1	<i>G-EARI</i>	22. 7.20	Prototype, delivered to Aircraft Transport and Travel Ltd. 5.3.20, crashed 16.8.20
2	<i>G-EARO</i>	15. 9.20	D.H.18A, "City of Cardiff", delivered 21.5.20, to Instone Air Line Ltd. 3.21, to R.A.E. 4.24, last flew 10.11.27
3	<i>G-EAUF</i>	11. 8.20	D.H.18A, "City of Paris", delivered 31.7.20, to Instone Air Line Ltd. 4.21, crashed 5.21
4	<i>G-EAWO</i>	4. 7.21	D.H.18A, delivered 21.5.21, to Instone 6.21, to Daimler Hire Ltd. 4.22, air collision with Farman Goliath <i>F-GEAD</i> at Grandvilliers, France, 7.4.22
5	<i>G-EAWW</i>	12.12.21	D.H.18B, "City of Brussels", to Martlesham for trials 21.9.21, delivered to Instone Air Line Ltd. 17.12.21, ditched off Felixstowe 2.5.24
6	<i>G-EAWX</i>	23. 1.22	D.H.18B, to Martlesham for trials 11.11.21, loaned to Instone Air Line Ltd. 1.22, dismantled 1923

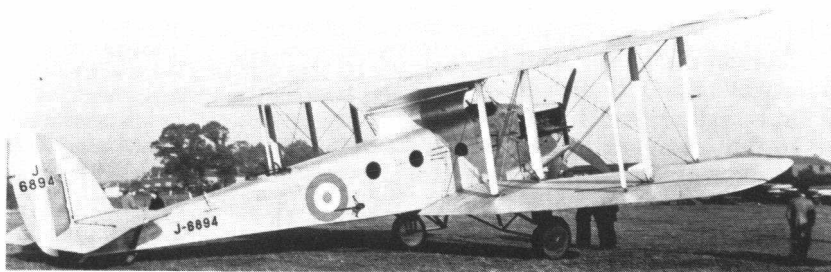
Note: The Aircraft Manufacturing Co. Ltd. earmarked constructor's numbers E.52 to E.57 for the six D.H.18s. When the de Havilland Aircraft Co. Ltd. took over, its own constructor's numbers were allotted as above.



The central cabane of the D.H.27 housed the main fuel tanks and took the place of the usual centre section struts.

De Havilland D.H.27 Derby

The Derby, the new de Havilland Company's first military aeroplane was a single engined long range, heavy day bomber built to Air Ministry Specification 2/20. Although originally designed by Airco around the 525 h.p. Rolls-Royce Condor IA engine, it was first test flown by Hubert Broad at Stag Lane on October 13, 1922 with a 650 h.p. Condor III driving a four bladed wooden airscrew. It was a large two bay biplane of conventional fabric covered, wire braced wooden construction and certain features developed on de Havilland commercial aeroplanes were embodied in the design, including the plywood covering to the long, slim fuselage, variable incidence tailplane and the oleo damped rubber shock legs. The wide track undercarriage was divided to make possible the carriage of a single heavy bomb centrally under the fuselage and the wings were made to fold. In place of centre section struts, the upper mainplane was directly attached to a large streamlined cabane which housed fuel tanks of 212 gallons capacity, and three circular portholes were provided in the cabin for the benefit of the navigator/bomb aimer. The other members of the crew consisted of the pilot, whose cockpit was ahead of the wings, and a rear



The first prototype D.H.27 Derby J6894, c/n 9, at Stag Lane in 1922. (De Havilland Photo.)

gunner with Scarff ring-mounted Lewis gun on top of the fuselage aft of the cabin. Two prototypes were ordered for competitive trials with the Avro Aldershot to determine the type most suitable for re-equipping No. 99 Squadron, Bircham Newton but the contract was awarded to the Aldershot. The Derby prototypes were then relegated to test duties at Martlesham Heath and at the naval experimental station in the Isle of Grain, from which J6894 made what was probably its last flight when it was flown to Farnborough on February 1, 1924.

SPECIFICATION AND DATA

Manufacturers: The de Havilland Aircraft Co. Ltd., Stag Lane Aerodrome, Edgware, Middlesex

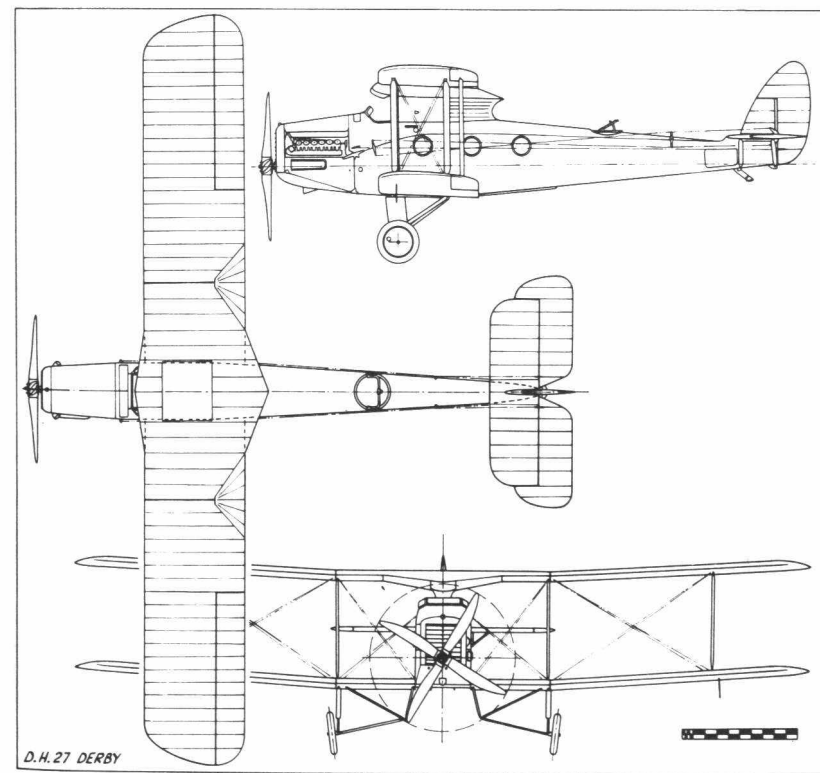
Power Plant: One 650 h.p. Rolls-Royce Condor III

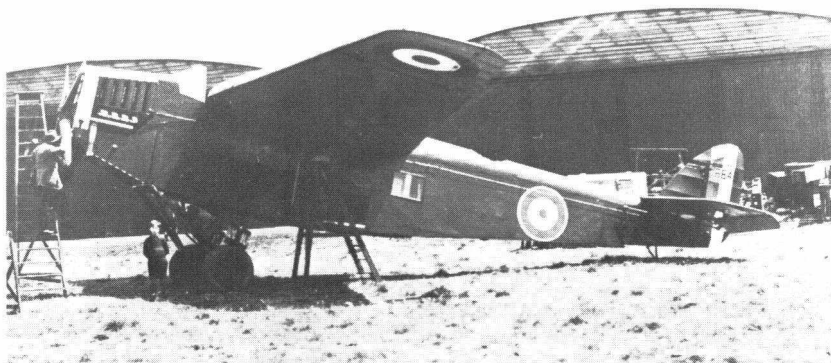
Dimensions: Span 64 ft. 6 in. Span folded 30 ft. 0 in. Length 47 ft. 4 in.
Height 16 ft. 10 in. Wing area 1,120 sq. ft.

Weights: Tare weight 6,737 lb. All-up weight 11,545 lb.
Military load 2,528 lb. Total load 4,808 lb.

Performance: Maximum speed 105 m.p.h.

Production: J6894, c/n 9, first flown 13.10.22, delivered to Martlesham 9.11.22
J6895, c/n 10, first flown 22.3.23, delivered to Northolt 17.5.23





The D.H.29 J6849, c/n 7, in its original form with frontal radiator and low-set cockpit.
(Aerofilms Photo.)

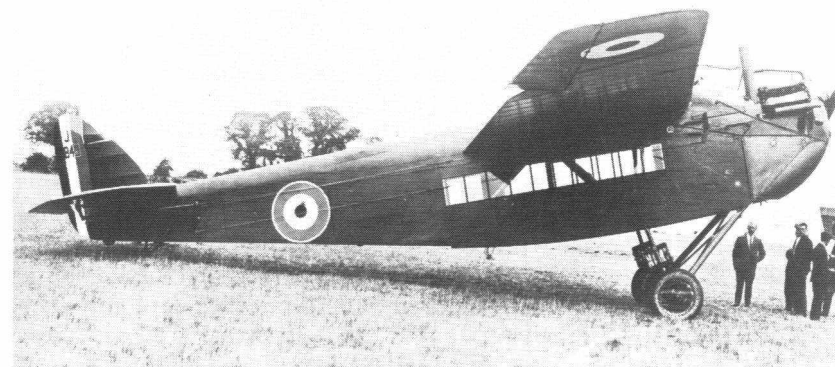
De Havilland D.H.29 Doncaster

Two D.H.29 long range aircraft were built at the Stag Lane works for the Research Dept., Air Ministry during the winter of 1920 but construction was not completed until the summer of 1921. They were historically important as the first British transport monoplanes to be fitted with thick section, high lift, cantilever wings and their design was developed from the smaller D.H.26 high wing project. Wind tunnel experiments were made in the 7 ft. tunnel in the old Airco works at Hendon and continued until the tunnel was sold to the University of Adelaide in 1921. A crew of two sat in an open cockpit (with the pilot on the starboard side), forward of a 13 ft. 3 in. glazed cabin of 345 cu. ft. capacity. Well proven features of the faithful D.H.18 were retained, including the oleo damped rubber shock absorbers, controlled cooling and fuselage construction. Once again the main structure consisted of spruce longerons and cross struts strengthened with a plywood covering to keep the cabin space free of internal bracing, but to provide a suitable anchorage for the extra wide track undercarriage, the floor was made wider than the roof. This resulted in a pronounced 'tumble home' to the sides of the fuselage.

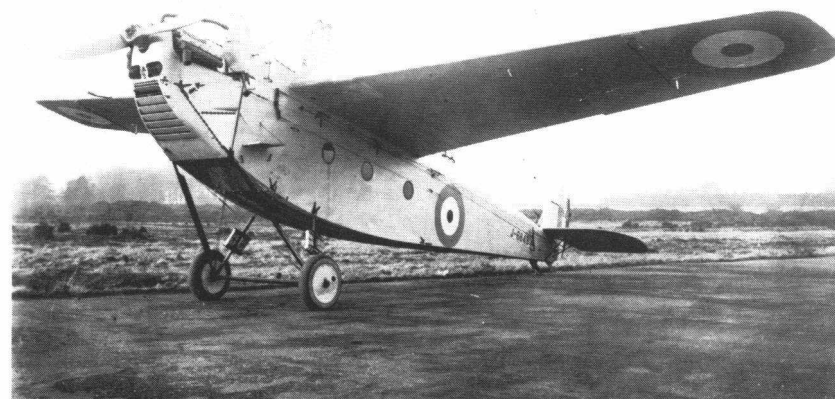
The tapered, cantilever wing was also of wooden construction, weighed 1,050 lb. and was internally braced, fabric covered and fitted with differential ailerons designed by Mr. A. E. Hagg. Fuel was carried in leading edge tanks of 115 gallons capacity and fed to the carburettors by gravity.

The prototype was first flown at Stag Lane on July 5, 1921 by Capt. Geoffrey de Havilland, but with the engine thrust line coinciding with the

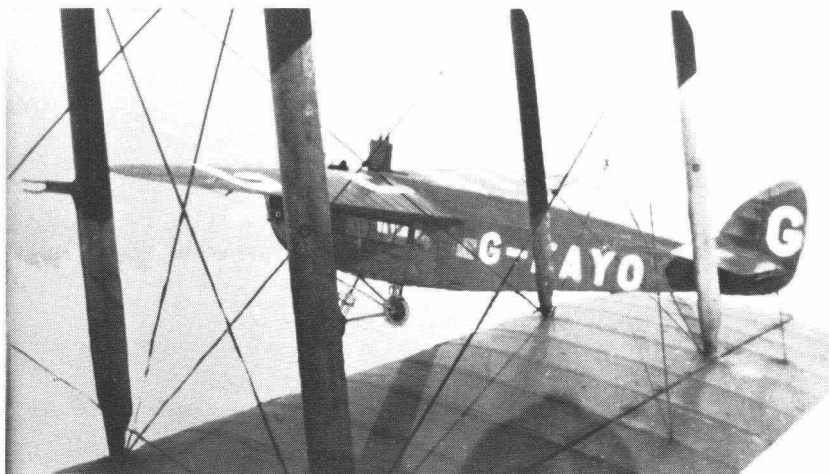
centre line of the fuselage, the cockpit received the full force of the slipstream, and the pilot was subjected to excessive buffeting. Emergency hatches and clear doped panels in the roof were stove in and performance was reduced by the disturbed airflow over the centre part of the wing. The ineffectiveness of the rudder was immediately apparent when the machine did a large diameter ground loop to port as the speed fell below 30 m.p.h. on landing. The first passenger was flight test observer W. K. Mackenzie who flew in the left hand seat when Capt. de Havilland made further test flights on July 7, 11 and 12. In a vain attempt to improve directional control, a new nose was built to raise the power plant by 20



The D.H.29 prototype in revised condition with raised cockpit and internal radiator compartment.



The D.H.29 in its final form as the Doncaster, with circular portholes and rear gunner's position. (Imperial War Museum Photo Q.65520.)



Rare air-to-air photograph taken from a D.H.9 chase plane of the civil D.H.29 on an early solo test flight by Capt. Geoffrey de Havilland. (*W. K. Mackenzie Photo.*)

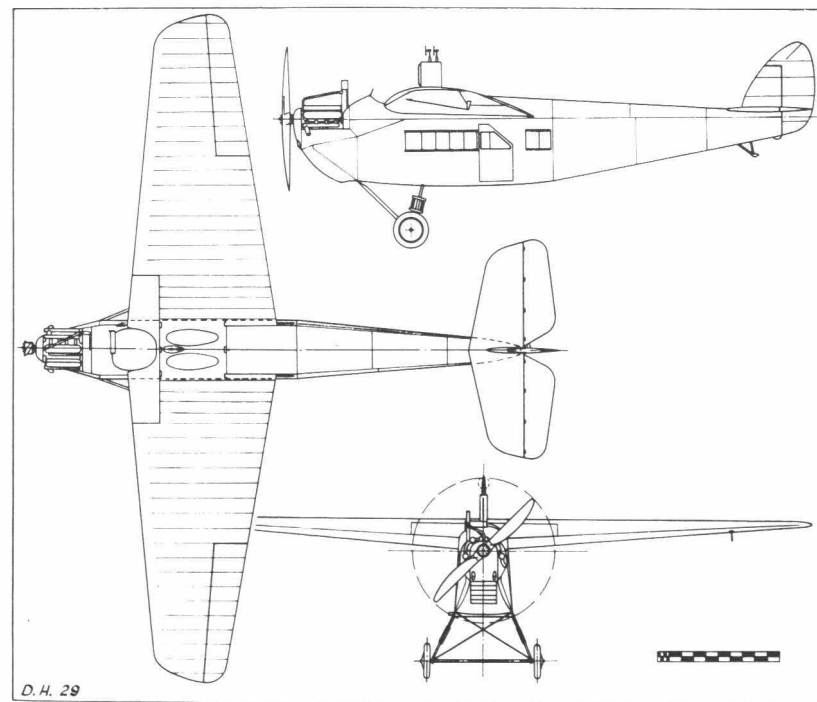
inches but as the original fuel tanks no longer gave a sufficient head of petrol, a low pressure fuel system was installed which necessitated the addition of a streamlined header tank on top of the centre section, surmounted by two wind driven pumps. It was also considered advisable to replace the original unbalanced elevator with a horn balanced unit after which, in January 1922, the aircraft went to Martlesham for official trials. The cabin was subsequently modified to have three small portholes in place of the original sliding windows, and equipped for photographic and wireless experiments. A gunner's cockpit fitted with a Scarff ring was built on top of the fuselage aft of the wings and thereafter the aircraft was known officially as the Doncaster. It was flown from Martlesham to the R.A.E., Farnborough on April 17, 1924 and in the following month was used for a series of 'Control of Doncaster' tests.



The civil D.H.29 *G-EAYO*, c/n 8, at the Imperial Air Conference demonstration at Croydon, February 3, 1922. (*'Flight' Photo 1632.*)

The second D.H.29 was completed in August 1921 as a commercial aircraft seating ten passengers. Wicker chairs were arranged with a gangway down the middle and a communicating door in the front bulkhead gave access to the pilot's cockpit. Progress in aeronautical design had been so rapid that although only five years had passed since the introduction of the two seat D.H.4, an aircraft with approximately the same wing area could now carry 12 persons. It also lifted a greater load than the D.H.18, even though powered by the same engine.

Daimler Hire Ltd. showed considerable interest in the D.H.29 but although its differential ailerons imparted exceptional lateral control, other control problems came to light which were not fully understood at the time, and the rudder was ineffective when taxiing. The need for new flying stock was so urgent that the company was forced to order the D.H.34 biplane instead and the civil D.H.29 *G-EAYO* thus saw no commercial service. Its only recorded public appearance was before delegates to the Imperial Air Conference at Croydon on February 3-6, 1922 where it was exhibited statically in the Aircraft Disposal Company's hangar and flown on the final day. In the following November it joined the first prototype at Martlesham where both aircraft took part in a very considerable programme of test flying and made valuable contribution to a fuller understanding of the behaviour of thick section cantilever wings.



D.H. 29

G-EAYO returned to Stag Lane where Hubert Broad made the first of several test flights on July 18, 1923, climbing to 10,000 ft. with Hessell Tiltman as observer on July 20 and 24. They ferried it back to Martlesham on September 13 and next day made a full load test at the all-up weight of 7,500 lb.

SPECIFICATION AND DATA

Manufacturers: The de Havilland Aircraft Co. Ltd., Stag Lane Aerodrome, Edgware, Middlesex

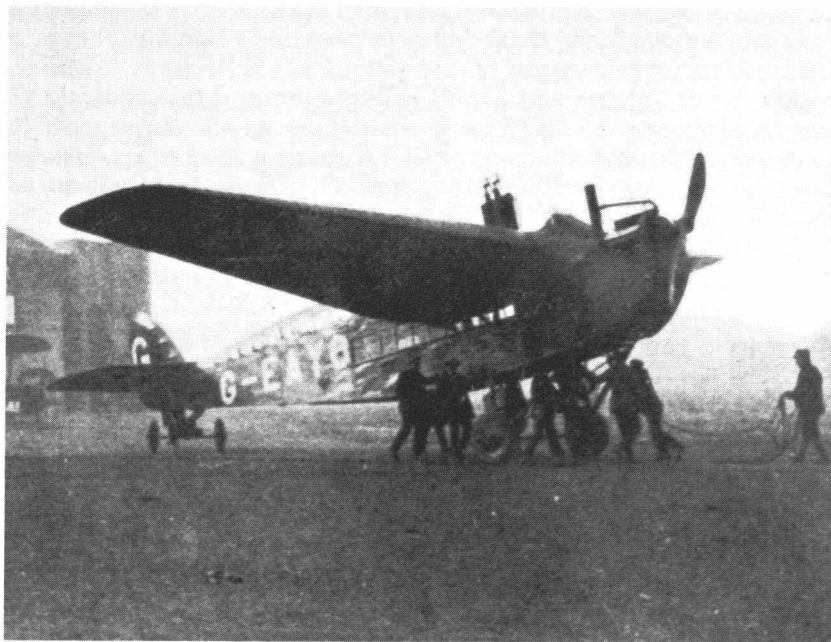
Power Plant: One 450 h.p. Napier Lion IB

Dimensions: Span 54 ft. 0 in. Length 43 ft. 0 in.
Height 16 ft. 6 in. Wing area 440 sq. ft.

Weights: (Original form) Tare weight 4,200 lb. All-up weight 7,273 lb.
Military load 1,431 lb. Total load 2,903 lb.
(Modified form) Tare weight 4,370 lb. All-up weight 7,500 lb.

Performance: Maximum speed at 10,000 ft. 116 m.p.h.
Cruising speed 100 m.p.h.
Landing speed 54 m.p.h.

Production: Military D.H.29 Doncaster, *J6849*, c/n 7, delivered to Martlesham 21.9.21
Civil D.H.29, unnamed, *G-EAYO*, c/n 8, originally ordered by the Air Council as *J6850*, delivered to Martlesham 9.11.22



The D.H.29 *G-EAYO* at Croydon in the early morning mists of February 6, 1922 before demonstration flights at the Imperial Air Conference. (Courtesy of M. R. S. Mitchell.)



G-EBBQ, c/n 27, the prototype D.H.34. (De Havilland Photo.)

De Havilland D.H.34

By 1921 purely civil aircraft such as the D.H.18 had been in service long enough for the economics of air transport to be understood and for the operators to have a clear idea of improvements that should be incorporated in a replacement type. It was already evident that commercial aviation could only pay its way if the D.H.18s were replaced by faster aircraft carrying more payload per horsepower. The de Havilland Aircraft Co. Ltd. had already attempted to satisfy these requirements and had built the ten passenger D.H.29 monoplane and completed designs for the eight passenger D.H.32 biplane. After consultations between Daimler Hire Ltd., Instone Air Line Ltd., the Air Council and the manufacturers, orders were placed for an improved version of the D.H.32 modified to include the best features of the D.H.29. The fuselage was a wooden structure, plywood covered for strength and almost identical in appearance to that of the D.H.29, but differing from it by having vertical sides and an internal diagonal strut in each bay to give triangulated strength. The Napier Lion was again installed as a detachable power unit with internal radiator and controlled cooling, but without ladders the engine was inaccessible from the ground for maintenance or starting and one of the stipulations made at the design conference was for built-in service platforms. These took the form of hinged doors in the nose which could be let down for the engineer to stand on when working on the engine or cranking it into life. Inertia starting, first tried out on the two D.H.18Bs, was adopted as standard and brought to an end all propeller swinging on commercial aeroplanes. Wooden three bladed airscrews were fitted as standard but the two bladed Leitner-Watts adjustable metal airscrew was fitted experimentally.

The two bay mainplanes of the D.H.34 were of wooden construction



G-EBBT, second D.H.34 for Instone Air Line Ltd., at Plough Lane in original form (five ribs outboard of outer interplane strut).



G-EBBT at Stag Lane, June 1925, with silver letters on the top wing after rebuild as D.H.34B (six ribs outboard of outer interplane strut). (P. T. Capon Photo.)

and the ailerons were operated by the highly successful differential gear first flown on the D.H.29 and fitted as standard to all later de Havilland types. As in the D.H.32, fire risk was reduced by attaching the fuel tanks, capacity 82 gallons, to the underside of the upper mainplanes, and noise level was reduced by placing the pilot's cockpit between the cabin and the engine, from which warmth was obtained by means of a muff round an exhaust pipe. The cabin door, fitted in the starboard side, was made almost triangular in shape to facilitate the loading of spare Lion engines but the narrow fuselage made it necessary to cut a circular hole (normally fabric covered) in the port side to give sufficient room for aligning the engine fore and aft.

Two D.H.34s were ordered by Daimler Hire Ltd., the first of which, *G-EBBQ*, made its first flight at Stag Lane on March 26, 1922 in the firm's all red colour scheme piloted by A. J. (later Sir Alan) Cobham. It was the prototype of an initial batch of ten aircraft, seven of which were

for the Air Council to Specification 17/21, and after delivery to the owners at Croydon on March 31st, the inaugural flight to Paris was made by Capt. W. G. R. Hinchliffe on April 2nd. Several of the Air Council's machines were leased to Instone Air Line Ltd., the first of which, the blue and silver *G-EBBR* "City of Glasgow", went into service on the same day as the prototype, reaching Paris with full load in 2 hours 40 minutes piloted by Capt. F. L. Barnard. *G-EBBQ* forced landed at Berck a fortnight later and turned over, leaving the second Daimler D.H.34 *G-EBBS* to maintain the service during its reconstruction at Stag Lane. The second Instone machine *G-EBBT* "City of New York" and the third Daimler *G-EBBU* were delivered during April and May 1922 but the latter also went back to Stag Lane to be rebuilt after another aircraft had landed on top of it at Croydon on May 23rd. Thus the stalwart *G-EBBS* was again compelled to carry on alone. Its first trip to Paris had been made on April 13, 1922 and on May 1st, piloted by Capt. E. D. C. Herne, 'BS became the first aircraft to make two return trips between Croydon and Le Bourget in one day. On June 2nd it increased this to five single trips in the day and by the end of 1922 *G-EBBS* had set up utilisation figures which, if impressive now, were hardly believable then. Scheduled services were flown on 122 days out of a possible 165, five days were spent on Air Ministry tests and double return journeys to Paris in one day were made on no less than 45 occasions. By December 5th 100,393 miles had been flown in nearly 8,000 hours without incident or overhaul, to provide a foretaste of the enormous mileages that D.H.34s were to cover so successfully during the next four years.

"City of New York", piloted by Capt. F. L. Barnard, inaugurated a new Croydon-Brussels service for Instone Air Line Ltd. on May 2, 1922 but in view of the small amount of traffic, the Director of Civil Aviation decided later in the year to prevent undesirable competition by means of a route allocation system. That to Brussels and Cologne was to be flown only by Instone Air Line Ltd., that to Paris by Handley Page Ltd. and a new route to Berlin by Daimler Hire Ltd. This was opened on September 15, 1922 by the faithful *G-EBBS* piloted by W. G. R. Hinchliffe and carrying Major Woods Humphery and Col. F. Searle, directors of the firm, but after the eighth trip, disagreement with the German Government forced a termination at Amsterdam until the service was resumed by 'BQ on June 25, 1923. Steady increases in traffic made necessary the delivery of one additional Air Council D.H.34 *G-EBBW* "City of Chicago" to Instone on August 13, 1922, and another, *G-EBBY*, to Daimler. This left the Air Council with one spare D.H.34, *G-EBBX*, which later went into service with Daimlers to replace *G-EBBU*, written off in an accident at Berck on November 3, 1922. The seventh production aircraft, built to the order of the Russian airline Dobrolet and first flown in June 1922, was crated and despatched by sea. Two additional aircraft *G-EBCX* and 'CY, ordered by the Air Council at the end of 1922, brought D.H.34 production to an end. The first of these was handed over to Daimler Hire Ltd., but there is no evidence that the second was completed.

Daimler Hire Ltd. were in the unique position of owning two D.H.34s outright and therefore able to operate services other than those earning subsidy. The Croydon–Amsterdam route was consequently extended inland to Manchester and this well patronised daily service was inaugurated by the elderly *G-EBBS* on October 23, 1922. Flights were also made to Castle Bromwich in connection with the British Industries Fair in March–April 1923 but on September 14th *'BS* stalled on the approach while attempting a forced landing at Ivinghoe Beacon, Bucks. and was destroyed with the loss of Capt. G. E. Pratt and L. G. Robinson and three passengers. This incident revived an age old controversy concerning the relatively high stalling speed of the D.H.34 and the opportunity was seized of equipping Daimler's *G-EBBX*, at that time being rebuilt at Stag Lane after a forced landing in the sea off Ostend, with mainplanes of greater area. The increase was obtained by adding 18 inches to the wing tip overhang so that the interplane struts remained in the same position relative to the centre line of the aircraft. At the same time an extra six inches of chord was added. When fitted with the new mainplanes the aircraft became the D.H.34B, D.H.34A being, it is believed, a preliminary design study. A reduction of 7 m.p.h. in the landing speed was obtained without any material effect on cruising performance and the aircraft was flown to Croydon for inspection by the owners on February 23, 1924. Trials for C. of A. were at once put in hand and maximum load tests were conducted during the second test flight on March 1st at an all-up weight of 7,200 lb. with 150 lb. of ballast in each of the nine seats and another 70 lb. in the rear locker.

When Imperial Airways Ltd. was formed on April 1, 1924 it inherited seven D.H.34s from former operators and kept them in regular service

on routes to Brussels and Amsterdam until 1926. One of the seven, *G-EBBR*, survived a forced landing by Capt. Wolley Dod in which it knocked down a 30 ft. tree at the foot of Whyteleafe Hill, near Kenley on February 11, 1924 to complete 127,000 miles in Instone service. Two months after becoming an Imperial Airways machine it was destroyed by fire when it struck a War Memorial on take off from Ostend piloted by Capt. A. L. Robinson on May 27th. Despite its modification, *'BX* crashed and burned soon after leaving Croydon on December 24, 1924 due, it is said, to fuel starvation, Capt. D. A. Stewart and seven passengers being killed in an attempted forced landing in circumstances very similar to those in which *'BS* was lost. Another aircraft, *G-EBBT*, was then sent to Stag Lane for conversion to D.H.34B and made its first flight in this condition piloted by H. S. Broad on June 12, 1925. Imperial Airways aircraft were not permitted to take part in races but D.H.34 *G-EBBY* was hired by a party of enthusiasts and left Croydon on July 3, 1925 piloted by Capt. F. Minchin to follow the King's Cup machines. Later in the day it was considerably damaged through running into a ditch while making a precautionary landing in bad weather at Carville near Newcastle. Again the opportunity was taken to make a D.H.34B conversion and it first flew in modified form on September 7th. Unlike *'BX* and *'BT*, this aircraft was tested with an extra pair of interplane struts braced by wires at each wing tip. An order was also placed with de Havillands for a set of mainplanes fitted with Handley Page slots but before these could be delivered, Imperial Airways had decided to re-equip with multi-engined aircraft and the remaining D.H.34s, withdrawn from service at the end of the financial year on March 31, 1926, were dismantled at Croydon.

SPECIFICATION AND DATA

Manufacturers: The de Havilland Aircraft Co. Ltd., Stag Lane Aerodrome, Edgware, Middlesex

Power Plant: One 450 h.p. Napier Lion

Dimensions, Weights and Performances:

	D.H.34	D.H.34B
Span	51 ft. 4 in.	54 ft. 4 in.
Chord	5 ft. 9 in.	6 ft. 3 in.
Wing area	590 sq. ft.	637 sq. ft.
Length	39 ft. 0 in.	39 ft. 0 in.
Height	12 ft. 0 in.	12 ft. 0 in.
Tare weight	4,574 lb.	4,674 lb.
All-up weight	7,200 lb.	7,200 lb.
Maximum speed	128 m.p.h.	—
Cruising speed	105 m.p.h.	100 m.p.h.
Landing speed	70 m.p.h.	63 m.p.h.
Range	365 miles	—

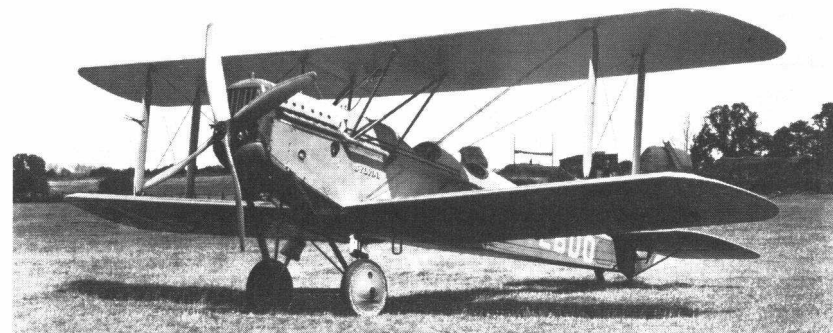
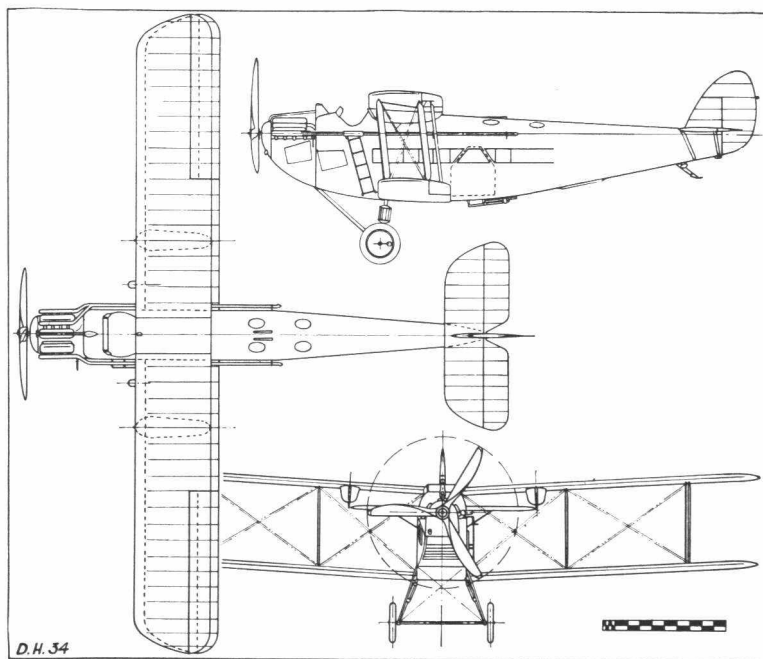


G-EBBX at Croydon in the summer of 1924, repainted in silver for Imperial Airways Ltd. (*Aviation Photo News.*)

Production:

	Constructor's No. and Registration	C. of A. Issued	Remarks
27	G-EBBQ	6. 5.22	Delivered to Daimler Hire Ltd. 31.3.22, crashed 8.23
28	G-EBBR*	6. 5.22	"City of Glasgow", delivered to Instone Air Line Ltd. 2.4.22, burned out at Ostend 27.5.24
29	G-EBBS	6. 5.22	Delivered to Daimler Hire Ltd. 10.4.22, crashed at Ivinghoe 14.9.23
30	G-EBBT*	6. 5.22	"City of New York", delivered to Instone Air Line Ltd. 28.4.22, converted to D.H.34B, scrapped 1926
31	G-EBBU	6. 5.22	Delivered to Daimler Hire Ltd. 29.4.22, crashed at Berck 3.11.22
32	G-EBBV*	19. 7.22	"City of Washington", delivered to Instone Air Line Ltd. 23.6.22, scrapped 1926
33	—	16. 6.22	Sold to Dobrolet, Russia
34	G-EBBW*	25. 8.22	"City of Chicago", delivered to Instone Air Line Ltd. 12.8.22, scrapped 1926
35	G-EBBX*	19. 9.22	Delivered to Daimler Hire Ltd. 29.8.22, converted to D.H.34B, crashed at Purley 24.12.24
36	G-EBBY*	25. 9.22	Delivered to Daimler Hire Ltd. 15.9.22, converted to D.H.34B, scrapped 1926
40	G-EBCX*	30.12.22	Daimler Hire Ltd., written off 10.6.25
41	G-EBCY	Nil	Believed not completed

* Taken over by Imperial Airways Ltd. 1.4.24.



Alan S. Butler's D.H.37 G-EBDO, c/n 43, in new condition with 275 h.p. Rolls-Royce Falcon III.

De Havilland D.H.37

In November 1920 Mr. Alan S. Butler bought a Bristol Type 29 Tourer open two seater and became the first British private owner to tour extensively at home and on the Continent. He also competed in the Aerial Derby at Hendon on July 16, 1921 and came second, but soon pensioned off his ageing relative of the Bristol Fighter and commissioned de Havillands to build a fast sporting and touring aeroplane to replace it. Economy of operation, accommodation for two passengers in addition to the pilot, generous tankage and a simple structure needing a minimum of maintenance, were specified and the result was the D.H.37, built in the early part of 1922 at a cost of some £3,000. So successfully did it meet the design requirements, that its enthusiastic owner put much needed capital into the company and became its chairman.

Powered by the dependable 275 h.p. Rolls-Royce Falcon III, obtained at low cost from the Aircraft Disposal Co. Ltd., the new machine carried the two passengers in tandem in the front cockpit. Dual control was fitted and a removable, sliding decking enabled the D.H.37 to be flown as a three, two or single seater. The immensely strong fuselage construction used in the D.H.18–29–34 series of transport aircraft was again employed and the D.H.37 was thus the first of the firm's long line of small aeroplanes with plywood covered fuselages. It was also the first civil type to be rigged as a single bay biplane with differential ailerons on the lower mainplane.

Eighty gallons of fuel were carried, half in a centre section tank mounted on splayed out N struts and the remainder in a tank forward of the front cockpit. The Falcon was cooled by a nose radiator and drove a four bladed wooden airscrew, and the undercarriage was of the usual independently sprung, oleo damped type. Elevator control was transmitted via a cross shaft behind the pilot, running in external ball races and fitted with double ended cranks from which outside cables ran aft. These cranks,

emerging from their acorn shaped ball race fairings, became a well known characteristic of de Havilland aircraft during the biplane era.

Two D.H.37s were laid down, the first of which, test flown in June 1922, became Mr. Butler's personal aircraft "Sylvia", named after his sister, and the second, completed in 1924, was shipped to Australia. Resplendent in red with gold wings, "Sylvia" made its debut as a single seater for the Aerial Derby at Croydon on August 7, 1922 but magneto trouble caused a late start and eventual retirement. In the first King's Cup Race which started at Croydon on September 8, 1922 Butler came 5th over the round-Britain course to Renfrew and back in a flying time of 7 hours 50 minutes. In the following month, when the British Government asked the de Havilland Hire Service to take Maj. Gen. Sir Warren H. Anderson to Constantinople at short notice, the D.H.37 was chosen because of its relatively high cruising speed, and piloted by A. J. Cobham left Croydon on October 8th, reaching its destination later the same day. Three years afterwards, on June 6, 1925 Cobham completed a similar one day trip to Morocco. Piloted by Maj. H. Hemming *G-EBDO* participated in the touring competition organised in connection with the International Aeronautical Exhibition which opened at Gothenberg, Sweden on July 20, 1923 and was placed 5th.

Accompanied by his engineer, K. C. Brown, A. S. Butler left Croydon on April 17, 1924 on the most extensive tour undertaken up to that time by a private owner. In four weeks "Sylvia" visited the Riviera, Milan, Belgrade, Sofia, Bucharest, Vienna, Prague, Warsaw, Brussels and Paris. Between May 11th and 13th Broad flew it to Berlin and back in a flying time of 12 hr. 45 min. to bring back urgent press photos. On May 30th Butler left for the International Aero Exhibition in Prague, covering the 600 miles nonstop in 5½ hours flying. On August 12, 1924, again piloted by the owner, the



The second D.H.37 at Belmont Common, Victoria, in 1924 just after post-delivery erection by Geelong Air Service. (C. D. Pratt Collection-AHSA Vic.-CDP.2.)

D.H.37 started from Martlesham and completed the 950 mile King's Cup course to Lee-on-Solent at an average speed of 112.65 m.p.h. and came 3rd. In the following year, piloted by Maj. H. Hemming and carrying two passengers, it was again 3rd, completing two circuits of an 804 mile Croydon-Renfrew course on July 3-4, 1925 in a flying time of 16 hours 42 minutes.

To improve performance Butler then had the Falcon engine replaced by the more powerful, yet lighter, A.D.C. Nimbus for the King's Cup Race at Hendon on July 9, 1926. Hubert Broad and he first flew it with this engine as the single seat D.H.37A, renamed "Lois", on July 6th. He was forced to land near Cheltenham with a fractured induction pipe but flew it in several races at the Bournemouth Summer Aviation Meeting on August 21-22, 1926 and won the Boscombe High Speed Handicap event.

On May 15, 1927 it carried the owner into second place in the Morris Open Handicap Race at Hamble but on June 4th its career came suddenly



G-EBDO in its D.H.37A configuration with 300 h.p. A.D.C. Nimbus engine. (P. T. Capon Photo.)

to an end through striking the racecourse number board while competing as a two seater in the High Power Handicap at Ensbury Park during the Bournemouth Whitsun Meeting, Maj. H. Hemming receiving slight, and the passenger fatal, injuries.

The second D.H.37 was shipped to Australia in 1924 for use by the Director of Civil Aviation and received that Dominion's first civil aircraft marking *G-AUAA*. Flown by Capt. F. W. Follett, it competed 'hors concours' in the New South Wales Aerial Derby at Richmond Aerodrome, Sydney on December 8, 1924 and was adjudged the unofficial winner.

Two years later *G-AUAA* was acquired by the Guinea Gold Co. Ltd. and shipped to Rabaul, New Guinea where an extra tank was fitted which enabled E. A. Mustar to ferry it to Lae on March 31, 1927. This 450 mile trip, mainly over the open sea, was completed in 5 hr. 19 min. and, on April 18, Mustar groped his way through the cloud-girt mountains to make the first-ever landing on the goldfield's sloping airfield at Wau. Thereafter the

D.H.37 flew mining supplies up from Lae in 20–30 minutes compared with the 7–10 day trek by local porters.

SPECIFICATION AND DATA

Manufacturers: The de Havilland Aircraft Co. Ltd., Stag Lane Aerodrome, Edgware, Middlesex

Power Plants: (D.H.37) One 275 h.p. Rolls-Royce Falcon III
(D.H.37A) One 300 h.p. A.D.C. Nimbus

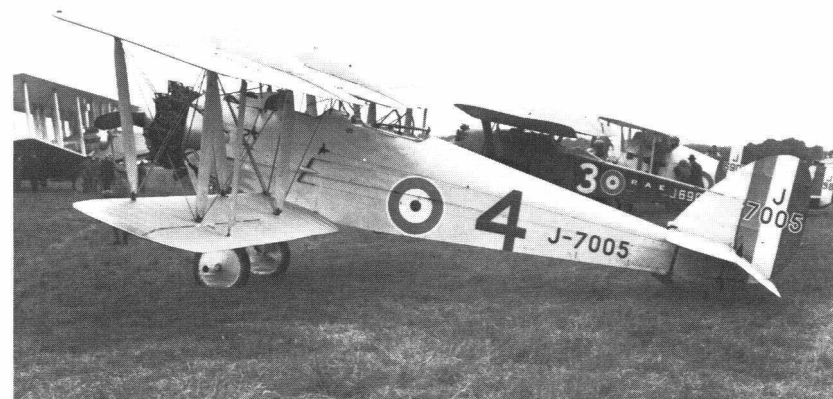
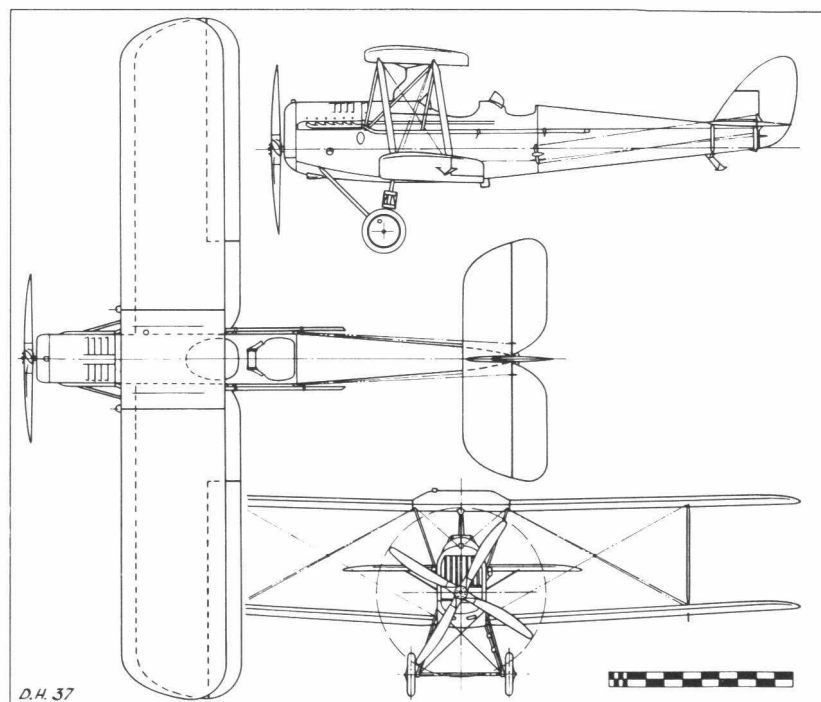
Dimensions: Span 37 ft. 0 in. Length 28 ft. 0 in.
Wing area 398 sq. ft.

Weights: (D.H.37) Tare weight 2,118 lb. All-up weight 3,318 lb.
(D.H.37A) Tare weight 2,452 lb. All-up weight 3,725 lb.

Performance: (D.H.37) Maximum speed 122 m.p.h. Initial climb 1,000 ft./min.
Ceiling 21,000 ft.
(D.H.37A) Maximum speed 133 m.p.h.

Production:

Constructor's No. and Registration	C. of A. Issued	Remarks
43 G-EBDO	11. 7.23	D.H.37 "Sylvia" 1922–26; D.H.37A "Lois" 1927; crashed at Bournemouth 4.6.27
105 G-AUAA	15. 5.24	Despatched to Australia 14.4.24, marking changed to VH-UAA in 1928, crashed at Crowdy Head, N.S.W., 25.3.32

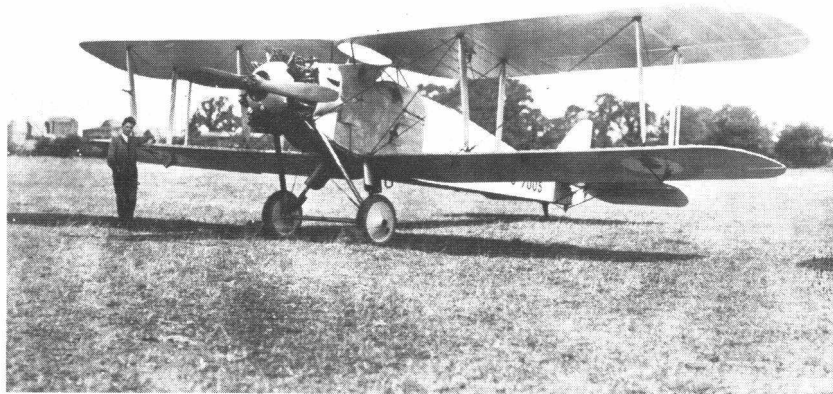


Dormouse J7005, c/n 84, in the New Types Park at Hendon, June 28, 1924.
(*'Flight' Photo.*)

De Havilland D.H.42 Dormouse

The Dormouse was a high performance, two seat, reconnaissance fighter designed to Air Ministry Specification D. of R. Type 22/22. The single prototype was built on standard de Havilland lines, with fuselage of spruce longerons and cross pieces covered with plywood, oleo damped undercarriage and variable incidence tailplane of the type first fitted to the D.H.11. Upper and lower mainplanes were of unequal span and the narrow chord of the lower gave the front interplane struts a considerable forward slope. For maximum view the pilot's cockpit, entered by a door on the starboard side, was placed high up to afford a commanding view in all upward directions through a large oval cutout in the top centre section. A generous V shaped trailing edge gap gave the gunner an equally good view forward and upward from his Scarff ring behind the pilot.

Powered by a 360 h.p. Armstrong Siddeley Jaguar II radial the Dormouse J7005 was first flown at Stag Lane on July 25, 1923 and made its public debut in the New Types Park at the Hendon R.A.F. Display on June 28, 1924 alongside the Vickers Type 94 Venture I and Bristol Type 52 Bullfinch which had been built to the same specification. An Army Co-Operation version to Specification D. of R. Type 8/24 and known as the D.H.42A Dingo I, had already been built and flew for the first time on March 12, 1924. As a result of fitting the large diameter 410 h.p. Bristol Jupiter III, the front fuselage differed considerably from that of the Dormouse. The two forward firing guns were no longer housed in neat



The Dormouse at Stag Lane in 1923 before the Scarff ring was fitted and showing the large cut-out above the pilot's head.

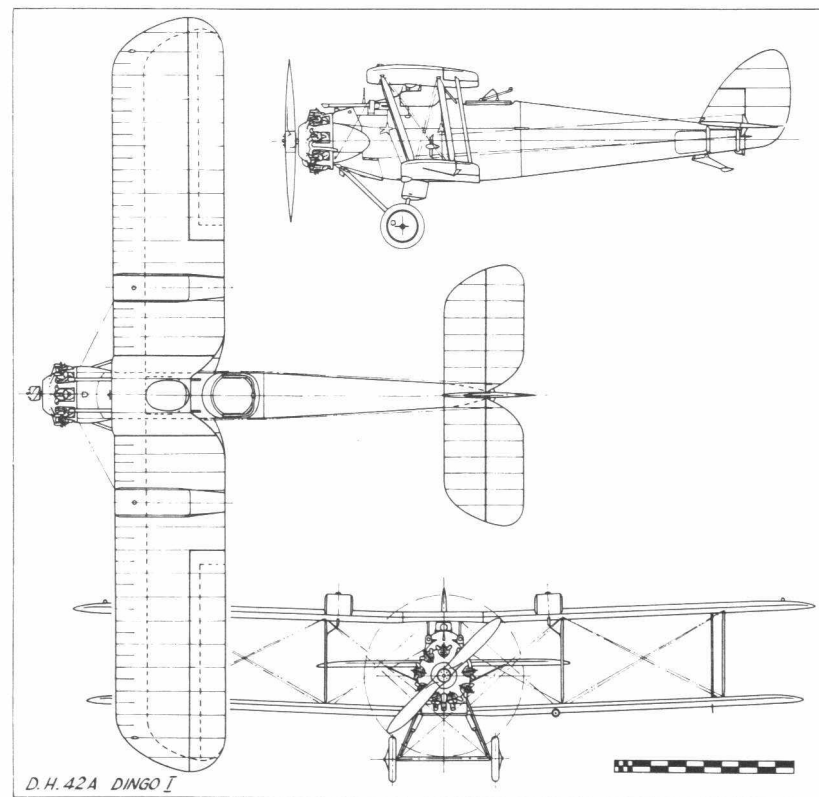


Side view of the D.H.42A Dingo I J7006, c/n 85, with 410 h.p. Bristol Jupiter III engine.

tunnels but were fitted externally to fire over the engine. Front centre section struts which raked inwards at the top on the Dormouse were splayed out on the Dingo and the large oval cutout over the pilot's seat was reduced to a smaller circular opening. The gunner's trailing edge gap was, on the other hand, cut right back to the rear spar and increased to fuselage width. The reduction of the pilot's aperture on the Dormouse to the size of that on the Dingo, was one of a number of modifications made in January 1925 before this aircraft was put through a new series of tests with a 420 h.p. Armstrong Siddeley Jaguar IV driving various airscrews and at a variety of all-up weights.

The D.H.42A Dingo I, J7006, was followed by a third prototype, J7007, designated D.H.42B Dingo II, first flown by Hubert Broad (who had also tested the previous aircraft) on September 29, 1926. The Dingo II was similar to Dingo I and also intended for Army Co-Operation duties but differed from both the previous aircraft, being of steel instead of wooden construction. Although the original drawings called for an Armstrong Siddeley Jaguar, the actual engine fitted was a 436 h.p. Bristol Jupiter IV installed with full exhaust manifold and long exhaust pipes of the type used on the Bristol Type 89. Gravity feed was used on all three D.H.42 machines, 60 gallons of fuel being carried in two large aerofoil section tanks on top of the upper mainplane. Those of the Dingo II were larger and held 81 gallons and this aircraft was also equipped with an elementary device under the rear fuselage for picking up messages.

The original Dormouse J7005 was delivered by air from Stag Lane to the R.A.E., Farnborough on March 27, 1925 for use by the Wireless and Photographic Flight and before being written off charge at the end of the year, was used for various W/T and magneto screening tests.





The Jupiter engined, metal fuselaged D.H.42B Dingo II J7007, c/n 115. (Imperial War Museum Photo MH.3318.)

SPECIFICATION AND DATA

Manufacturers: The de Havilland Aircraft Co. Ltd., Stag Lane Aerodrome, Edgware, Middlesex

Power Plants: (D.H.42) One 360 h.p. Armstrong Siddeley Jaguar II
One 420 h.p. Armstrong Siddeley Jaguar IV
(D.H.42A) One 410 h.p. Bristol Jupiter III
(D.H.42B) One 436 h.p. Bristol Jupiter IV

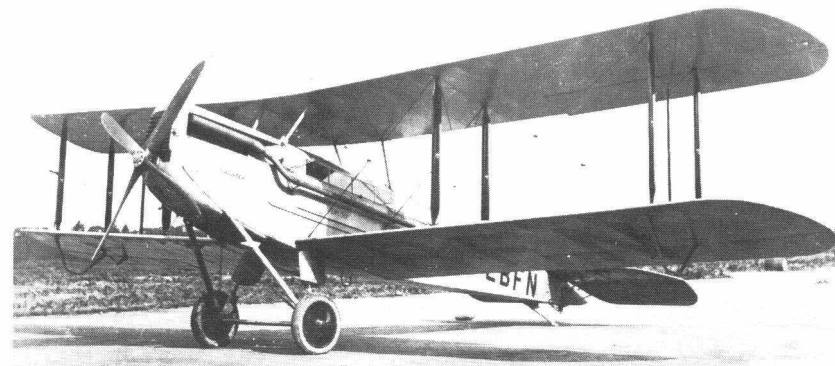
Dimensions, Weights and Performances:

	D.H.42	D.H.42A	D.H.42B
Span, upper . . .	41 ft. 0 in.	41 ft. 6 in.	41 ft. 6 in.
Span, lower . . .	39 ft. 6 in.	39 ft. 11½ in.	39 ft. 11½ in.
Length . . .	28 ft. 3 in.	28 ft. 3 in.	28 ft. 3 in.
Wing area . . .	389 sq. ft.	398 sq. ft.	398 sq. ft.
Tare weight . . .	2,513 lb.	2,346 lb.	2,780 lb.
All-up weight . .	3,897 lb.	3,700 lb.	4,038 lb.
Military load . .	434 lb.	—	628 lb.
Total load . . .	1,322 lb.	—	1,685 lb.
Maximum speed . .	125 m.p.h.*	127 m.p.h.	128 m.p.h.
Ceiling . . .	16,000 ft.*	17,500 ft.	—

* With Jaguar IV 128 m.p.h. and 15,700 ft.

Production:

Constructor's No. and Serial	Built	Remarks
84 J7005	1923	D.H.42 Dormouse; to Farnborough 27.3.25, withdrawn from use 12.25
85 J7006	1925	D.H.42A Dingo I; crashed at Martlesham 5.6.24, wreck returned to Stag Lane
115 J7007	1924	D.H.42B Dingo II; delivered from Stag Lane to Farnborough by air 16.11.26



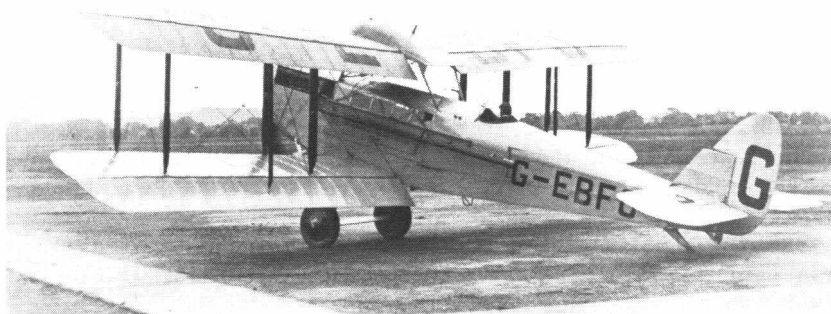
The D.H.50 prototype G-EBFN, c/n 73, showing the original type of radiator and curved under-fairing. (Imperial War Museum Photo MH.6787.)

De Havilland D.H.50

The D.H.50 was a four seater designed as a result of operational experience with, and as a replacement for, the D.H.9C aircraft of the de Havilland Hire Service. Using the same engine, a 230 h.p. Siddeley Puma, the new type carried an additional passenger at a higher cruising speed and was a two bay biplane with plywood covered fuselage with the pilot in an open cockpit behind the cabin. In some respects therefore, it could be regarded as a scaled down version of the D.H.18B. Broad made the first flight in the prototype G-EBFN "Galatea" at Stag Lane on July 30, 1923 and only four days later A. J. Cobham flew it to the International Aeronautical Exhibition at Gothenberg. Competing against the foremost European commercial aircraft of the day, the D.H.50 won first prize in the reliability trial flown daily between Gothenburg and Copenhagen from August 7-12. A year later on August 12, 1924 the same aircraft and pilot averaged 106 m.p.h. over the round Britain course and won the King's Cup. As if these achievements were not sufficient to ensure an outstanding commercial career for the D.H.50, Cobham left Croydon a week later on September 19th and flew 'FN to Tangier and back in 28 flying hours, covering the 920 miles between London and Madrid nonstop. After two years with the Hire Service "Galatea" went to Northern Air Lines Ltd., Woodford and thence to West Australian Airways Ltd. in 1926.

Subsequent D.H.50s had 8 square, instead of 16 circular, transparent roof lights and the second aircraft, G-EBFO, was that in which Cobham made long distance flights which earned him a knighthood. Fitted experimentally with full span automatic camber changing flaps and piloted by H. S. Broad, it carried Air Vice Marshal Sir Sefton Brancker, Lord

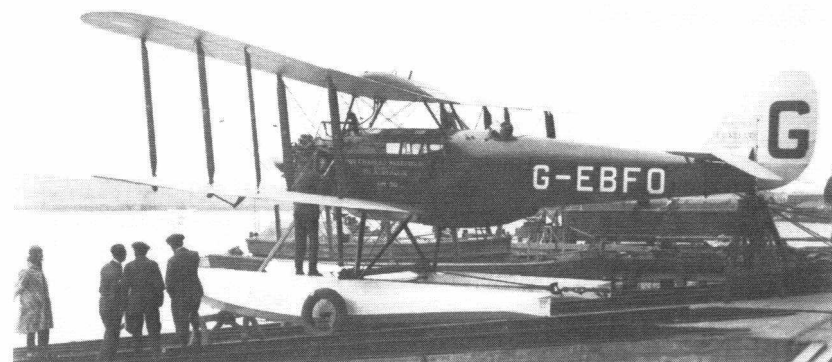
Thompson and Mr. Frank Hodges 600 miles in 6½ hours to attend the Prague Aero Exhibition on May 30, 1924. The flaps reduced the landing speed by some 6 m.p.h. but were removed before the aircraft made its 17,000 mile flight to Rangoon to enable Sir Sefton Brancker to attend a conference. Piloted by Cobham it covered this distance between November 20, 1924 and March 18, 1925 in 220 hours flying time. After its return, 'FO came to grief in a heavy landing in fog at Stag Lane at the end of a Hire Service flight and the engine broke away from the fuselage. During reconstruction a 385 h.p. Armstrong Siddeley Jaguar aircooled radial was fitted to give extra power needed when taking off from high altitude aerodromes in the course of an Imperial Airways survey flight to the Cape. Two additional fuel tanks of 69½ gallons total capacity were fitted in the cabin and Cobham left Croydon on November 16, 1925 accompanied by his engineer A. B. Elliott and a photographer B. W. G. Emmott. The 16,000 mile flight was a masterpiece of sound organisation and Cape Town was reached on February 17, 1926. The D.H.50 landed at Croydon on March 13th after an even more rapid return flight and preparations were immediately put in hand for a similar survey flight to Australia. As much of this route lay over water, the aircraft was fitted with twin metal floats by Short Bros. Ltd. at Rochester and the flight started from the Medway in the early hours of June 30, 1926. The return flight to Melbourne was made with such apparent ease that it caused a sensation but cost the life of Cobham's talented engineer A. B. Elliott, killed by a stray Bedouin bullet when flying over the desert between Baghdad and Basra on July 5th. When 'FO returned to make its historic landing on the Thames at Westminster on October 1st, its Empire flights totalled 62,000 miles and in 1929 a Nimbus engine was fitted before shipment to West Australian Airways Ltd. who subsequently equipped it with Handley Page slots and a larger radiator. It was scratch machine in the 2,200 mile Sydney-Perth race later that year but burst both tyres when W.A.A. pilot B. Heath's goggles slipped when low flying!



The second D.H.50 *G-EBFO*, c/n 74, with de Havilland full span, automatic, camber-changing flaps.



A. J. Cobham's Jaguar engined D.H.50J being serviced at Stag Lane for the Australia Flight, May 1926. The Fairey-Reed metal airscrew was tried but not used. (P. T. Capon Photo.)



A. B. Elliott running up the D.H.50J after the floats were fitted at Rochester, June 1926. (Short Bros. Photo.)

The third D.H.50, *G-EBFP*, was a familiar sight at Croydon for eight years, first in Imperial Airways blue and later in silver and black. In the hands of the charter section manager Capt. G. P. Olley and others, it was in daily use for private hire and scheduled service relief until disposed of to the Iraq Petroleum Transport Co. Ltd. in 1932. Its final year of service was spent in ferrying the company's personnel from Haifa to the pumping stations along the desert pipeline. A companion aircraft, *G-EBKZ*, added to the Imperial Airways fleet in 1925, was a production model known as D.H.50A with slightly longer cabin, centre section struts more splayed out, additional radiator area and the undercarriage set slightly farther forward. Fourteen D.H.50As were built at Stag Lane, 9 being to Australian order, the first of which, *G-AUAB*, was built in 1924 along with a D.H.37 and two D.H.53s for the use of the Controller of

Civil Aviation, Australia. Its long career began on August 7, 1924 when it left Melbourne piloted by Capt. E. J. Jones on a round-Australia survey flight with the Director of Civil Aviation Lt. Col. H. Brinsmead aboard. In 23 consecutive days flying it completed 7,658 miles, and on December 8, 1924 competed 'hors concours' in the New South Wales Aerial Derby at Richmond, Sydney and although carrying four passengers came an unofficial second. Seventeen years later, in November 1942, it was fitted with a Pratt and Whitney Wasp C radial and impressed for war service.

The first D.H.50A to enter commercial service in the Commonwealth was the QANTAS machine *G-EBIW/G-AUER* which also became the first aircraft to carry an Australian Prime Minister on an official journey when Hudson Fysh piloted Mr. S. M. Bruce from Winton to Longreach on November 30, 1924 during his election tour. In April 1927 it was named "Hermes" and on August 2 made the first Flying Doctor flight from Cloncurry to Mt. Isa piloted by Capt. A. N. Evans. In May 1928 it was renovated, re-rigged and fitted with two stretchers, a strengthened undercarriage and renamed "Victory" in order that a permanent service might be set up. The first trip was made to Julia Creek on May 17, 1928, and, based at Cloncurry, "Victory" gave impressive service for many years, at first piloted by Capt. A. H. Affleck and then almost exclusively by Capt. Eric Donaldson. It was eventually disposed of to Rockhampton Aerial Services Ltd. and fell into the sea off the Queensland coast in 1935.

Three D.H.50As were also shipped to West Australian Airways Ltd. for the Wyndham-Perth-Adelaide service, and three to the Larkin sponsored Australian Aerial Services Ltd. for the mail run between Adelaide and Sydney. The first Larkin machine *G-AUEI* was delivered at Hay, S.A., on November 15, 1924 and left on the inaugural service to Adelaide on the 18th piloted by F. S. Briggs. Two additional D.H.50As



O-BAHX, third of the three D.H.50As built by SABCA at Brussels in 1925. The extra nose under-fairing necessitated by the larger radiator of the D.H.50A is clearly shown. (SABENA Photo.)



D.H.50A *G-AUEJ*, c/n 130, "Wattle Bird" of Australian Aerial Services Ltd. after reconstruction as a D.H.50J *VH-UEJ* with D.H.61-type Bristol Jupiter VI installation. (De Havilland Photo.)

were also sold to the Australian Government, the first for the personal use of Lord Stonehaven, the Governor General. This aircraft was equipped with interchangeable wheel and float undercarriage and a 9 ft. 6 in. diameter Fairey-Reed metal airscrew, the handing over ceremony at Rochester on March 24, 1926 including demonstration flying from the Medway by de Havilland test pilot H. S. Broad. When relegated to R.A.A.F. service it was allotted the serial *A8-1* and left Melbourne on September 28, 1926 piloted by Gp. Capt. R. Williams D.S.O., O.B.E., on a survey flight up the east coast of Australia to Thursday Island, the Solomons and the Bismarck Archipelago. The much travelled seaplane returned to Melbourne without incident on December 7th having completed 10,000 miles of ocean flying. After conversion to landplane it took off from Melbourne on July 21, 1927 flown by the same pilot and accompanied by two D.H.9s on a 13,000 mile internal air route survey successfully completed on September 10th. The other Government D.H.50A was a civil aircraft *G-AUAY* fitted with D.H.9A type external fuel tanks (later removed), under the upper mainplane and together with 'AB' was in continual service for close on 18 years until fitted with Bristol Jupiter VI and impressed by the R.A.A.F. An almost exactly similar aircraft supplied to the New Zealand Air Force for the aerial survey of that Dominion was the first powered by a 300 h.p. A.D.C. Nimbus. In 1930 it was loaned to Air Travel (N.Z.) Ltd. and piloted by Sqn. Ldr. M. C. McGregor flew a short lived Christchurch-Dunedin service under the temporary Hawera Aero Club fleet number '17'. July 1933 found it working out its useful life as a D.H.50J with Holdens Air Transport in New Guinea.

So successful had QANTAS found its original D.H.50 and so impressive its serviceability record that the D.H.50A was chosen to replace the veteran D.H.4 and the D.H.9Cs. As de Havillands were preoccupied with

Moth production they granted a manufacturing licence to QANTAS and made available all drawings and metal parts. QANTAS works manager Arthur Baird produced seven D.H.50As at the Longreach base and personally flight tested each one. Four were of the standard Puma engined variety, the first of which, *G-AUFA* "Iris" flew on August 8, 1926 and was christened by Lady Stonehaven 10 days later. The other three were powered by 450 h.p. Bristol Jupiter VI engines to improve the rate of climb and cruising speed. Their designation, D.H.50J, first used on Cobham's Jaguar engined machine, was ambiguously applied to those with Jupiters and as a concession to primitive operating conditions, undercarriage axles were made extra long to take an additional pair of wheels when operating from waterlogged aerodromes. With one exception they received mythological names, and many of their flights became milestones in Australian aeronautical history. "Iris" carried Lord and Lady Stonehaven across Australia to Darwin in 1926 and "Perseus" piloted by Hudson Fysh carried the first air-delivered newspapers to Normanton on the Gulf of Carpentaria on July 1, 1927. On April 23, 1929 Capt. L. J. Brain in "Atalanta" found Anderson and Hitchcock's ill-fated Westland Widgeon "Kookaburra" deep in the interior, and on May 27th located the wreck of Moir and Owen's England-Australia Vickers Vellore I *G-EBYX* at Cape Don, N.T. Two years later on May 7, 1931 the same aircraft and pilot inaugurated the short lived unsubsidised Brisbane-Townsville service.

The final D.H.50J "Hippomenes" played a prominent part in the second experimental England-Australia air mail service, flying Darwin-Brisbane (Capt. R. B. Tapp) on May 12-13, 1931 and the return service



The Jupiter engined *VH-ULG* "Hippomenes", last of the QANTAS-built D.H.50s, at Longreach in August 1929. (QANTAS Photo.)

over this section piloted by Hudson Fysh on May 17-18th. It also flew on the first regular southbound service from Darwin to Mt. Isa piloted by Capt. L. J. Brain on December 19-20, 1934. The mails were then transferred to the unnamed *G-AUJS* (Capt. Eric Donaldson) en route to Charleville. At the end of its QANTAS service, "Hippomenes" was sold to Pacific Air Transport Ltd. in New Guinea and in 1935 set up the incredible record of 15 round trips in one day between Lae and Wau, a total distance of 1,200 miles.

Concurrently with QANTAS production, Larkin built a single Puma D.H.50A under licence and West Australian Airways Ltd. built three more, completing their first aircraft in November 1926 and two others in the following year. One Jupiter engined D.H.50J was also built at Stag Lane to the order of the North Sea Aerial and General Transport Co. Ltd. and equipped with Fairey-Reed metal airscrew, additional D.H.9A type fuel tanks and Short twin metal floats for a pioneer mail service along the Nile between Khartoum and Kisumu. Christened "Pelican" at Rochester on November 15, 1926, it was shipped to the Sudan and Capt. T. A. Gladstone flew the inaugural service in the following month. After but a few flights it struck floating wreckage when taking off and was seriously damaged, necessitating shipment to the Blackburn base at Athens for repairs. The service was twice more interrupted by accidents and finally abandoned when "Pelican" was wrecked when landing from a test flight at Kisumu on October 17, 1927.

The last British built D.H.50A certificated was *G-EBQI*, built for Air Taxis Ltd. in 1927 and intended for use in temperate climates, was the only D.H.50A fitted with the original D.H.50 type radiator. Sir Philip Richardson bought it in 1929 and kept it at Brooklands but later sold it to Northern Air Lines Ltd. The major part of its career was spent as a taxi aircraft after its return to the Brooklands School of Flying Ltd. in 1930. Piloted by Capt. Duncan Davis, it even carried a Red Indian chief on a flight over London.



G-EBOP "Pelican", the Jupiter engined D.H.50 seaplane operated briefly on the Nile by the North Sea Aerial and General Transport Co. Ltd. 1926-27.

Outside the Commonwealth the D.H.50A was built under licence by SABCA in Belgium and by the Aero concern in Prague. SABCA built three, which from 1925–1928 were based at Kinshasa in the Belgian Congo and operated a regular service to Stanleyville. By contrast Aero built seven of these aircraft for the Czech Government air service, C.S.A., which had been using a single British built D.H.50A since February 1925. The third Aero machine flew on February 11, 1926 and the seventh at the end of the following month. All were powered by 240 h.p. Walter W-4 in-line watercooled engines.

SPECIFICATION AND DATA

Manufacturers: The de Havilland Aircraft Co. Ltd., Stag Lane Aerodrome, Edgware, Middlesex
Queensland and Northern Territory Aerial Services Ltd., Longreach, Queensland, Australia
West Australian Airways Ltd., Maylands Aerodrome, Perth, Western Australia
The Larkin Supply Co. Ltd., Melbourne, Victoria, Australia
Société Anonyme Belge de Constructions Aéronautiques, 1362 Chaussée de Haecht, Haren, Brussels, Belgium
Aero Tovarno Letadel, Vysocany, Prague, Czechoslovakia

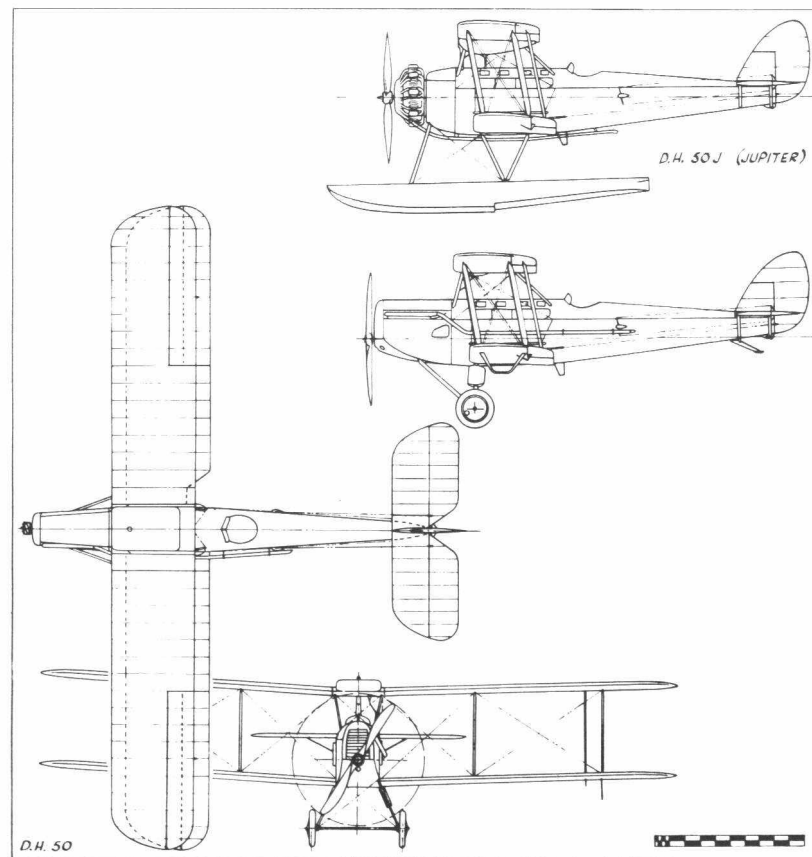
Power Plants: One 230 h.p. Siddeley Puma
One 300 h.p. A.D.C. Nimbus
One 385 h.p. Armstrong Siddeley Jaguar III
One 420 h.p. Bristol Jupiter IV
One 450 h.p. Bristol Jupiter VI
One 515 h.p. Bristol Jupiter XI
One 450 h.p. Pratt and Whitney Wasp C
One 240 h.p. Walter W-4

Dimensions: (D.H.50) Span 42 ft. 9 in. Length 29 ft. 9 in.
Height 11 ft. 0 in. Wing area 434 sq. ft.
(D.H.50A) Span 42 ft. 11½ in. Length 30 ft. 5 in.
Height 11 ft. 7 in. Wing area 437 sq. ft.
(D.H.50J, with Jaguar) Length 28 ft. 9 in.

Weights and performances:

Type	D.H.50		D.H.50A		D.H.50A
Engine	Puma		Puma		Nimbus
Undercarriage	wheels	floats	wheels	floats	wheels
Tare weight	2,253 lb.	2,800 lb.	2,413 lb.	2,688 lb.	2,400 lb.
All-up weight	3,900 lb.	4,200 lb.	4,200 lb.	4,200 lb.	4,200 lb.
Maximum speed	112 m.p.h.	108 m.p.h.	109 m.p.h.	106 m.p.h.	125 m.p.h.
Cruising speed	95 m.p.h.	95 m.p.h.	95 m.p.h.	—	105 m.p.h.
Initial climb	605 ft./min.	580 ft./min.	605 ft./min.	—	950 ft./min.
Ceiling	14,600 ft.	10,500 ft.	14,600 ft.	10,000 ft.	18,000 ft.
Range	380 miles	360 miles	375 miles	360 miles	380 miles

Type	D.H. 50J		D.H.50J	
Engine	Jaguar		Jupiter	
Undercarriage	wheels	floats	wheels	floats
Tare weight	2,532 lb.	2,830 lb.	2,336 lb.	2,840 lb.
All-up weight	4,200 lb.	4,200 lb.	4,200 lb.	4,200 lb.
Maximum speed	136 m.p.h.	126 m.p.h.	132 m.p.h.	126 m.p.h.
Cruising speed	110 m.p.h.	110 m.p.h.	110 m.p.h.	110 m.p.h.
Initial climb	1,200 ft./min.	920 ft./min.	1,250 ft./min.	1,100 ft./min.
Ceiling	20,000 ft.	16,500 ft.	20,000 ft.	16,000 ft.
Range	660 miles	275 miles	240 miles	275 miles



Production:

Constructor's No. and Registration	C. of A. Issued	Remarks
(a) Built by de Havilland at Stag Lane		
73	G-EBFN	2. 8.23 "Galatea", to West Australian Airways 2.26 as G-AUEY, withdrawn from use 9.4.35
74	G-EBFO	12.11.23 Temporarily D.H.50J (C. of A. issued 14.11.25), to West Australian Airways 1.29 as VH-UMC, crashed at Mia Mia Station, W.A. 1.3.32
75	G-EBFP	12.11.23 Imperial Airways Ltd., scrapped at Croydon 1933
106	G-AUAB	28. 7.24 Loaned to the R.A.A.F. 5.31-5.32, impressed 11.42 as A10-1
116	G-EBIW	28. 5.24 QANTAS "Hermes" (later "Victory") G-AUER, lost at sea off Caloundra, Q., 8.12.35
127	G-AUEL	30. 7.24 West Australian Airways Ltd., struck off register 30.7.40
128	G-AUEM	30. 7.24 West Australian Airways Ltd., crashed at Footscray, V., 28.1.40
129	G-AUEI	13. 8.24 Australian Aerial Services Ltd., struck off register 10.7.35
130	G-AUEJ	21. 8.24 Australian Aerial Services Ltd., "Wattle Bird", Jupiter fitted by Larkin 1929, crashed at Methul, N.S.W. 9.6.32
131	G-AUEK	30. 8.24 Australian Aerial Services Ltd., later fitted with Bristol Jupiter XI
132	G-EBKJ	1.12.24 First flight at Stag Lane by H. S. Broad 1.12.24, to the Czech Government 1.25 as L-BALG, later OK-ALG
133	G-EBKZ	11. 6.25 Imperial Airways Ltd., crashed at Plymouth 23.10.28
134	A8-1	4. 5.26 R.A.A.F. aircraft for the use of the Governor General of Australia
135	I35	21. 7.33* With Nimbus engine for the N.Z.A.F., sold to Holdens, New Guinea 1933 as VH-UQX
136	G-EBQI	5. 5.27 Scrapped at Brooklands 4.33
137	G-AUAY	30. 4.28 "Warrego", Controller of Civil Aviation Australia, destroyed by enemy action in New Guinea 11.3.42
281	G-EBOP	21.12.26 D.H.50J "Pelican", wrecked on the Nile, Kisumu, 17.10.27

(b) D.H.50As built by QANTAS at Longreach

1	G-AUFA	17. 8.26 "Iris"; to N. Queensland Airways 10.36, crashed 1.12.37
2	G-AUFW	11. 6.27 "Perseus", crashed at Capella, Q., 20.7.36
3	G-AUGD	9. 8.27 "Pegasus", to Holdens, New Guinea 10.32 as D.H.50J, struck off register 10.36
6	G-AUJS	22. 1.29 Unnamed, crashed at Yeppoon, Q., 2.12.37

* Australian C. of A.

Constructor's No. and Registration	C. of A. Issued	Remarks
(c) D.H.50Js built by QANTAS at Longreach		
4	G-AUHE	10. 5.28 "Atalanta", later fitted with Jupiter as D.H.50J, crashed at Winton, Q., 3.10.34
5	G-AUHI	10. 5.28 "Hermes", crashed at Golden Grove, S.A., pilot C. W. A. Scott, 4.9.28
7	VH-ULG	3. 8.29 "Hippomenes", crashed at Chimbu, N.G., 10.11.37

(d) D.H.50As built by West Australian Airways Ltd. at Perth, W.A.

1	G-AUFD	27. 1.27 Crashed at Geraldton, W.A., 11.5.29
2	G-AUFE	8. 2.27 Crashed at Condobolin, N.S.W., 26.8.37
3	G-AUFN	22. 8.27 Withdrawn from use 7.33

(e) D.H.50A built by Larkin Aircraft Supply Co. Ltd. at Melbourne

1	VH-UMN	9.10.29 "Sun Bird", to Mandated Airlines Ltd., New Guinea 10.36 as D.H.50J, struck off register 10.37
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(f) Built by SABCA at Brussels 1925

Not given	O-BAHV	5.25 History obscure
Not given	O-BAHW	5.25 History obscure
Not given	O-BAHX	5.25 Withdrawn from use in the Congo 3.37

(g) Built by Aero at Prague 1925-1926

1 to 7 L-BAHA to L-BAHG for Ceskoslovenske Statni Aeroline, Prague; 'HB to Masaryk Air League, Prague 1931 as OK-AHB; 'HC to J. Arigi, Marianske Lazne 1931 as OK-AHC; 'HG to Východočeský Aeroklub, Prague 1931 as OK-AHG



D.H.50 L-BAHF built under licence by Aero at Prague in 1926.



The 50 year old "Miss Kenya", only survivor of the three D.H.51s, flying near Old Warden in 1974. (*Air Portraits*.)

De Havilland D.H.51

At a time when the 1923 Lympne Trials were encouraging the construction of low powered single seat light planes, the de Havilland Company designed a larger, more practical, touring vehicle and gave it the type number D.H.51. A real attempt was made to produce a cheap aircraft by adhering to simple and well proven constructional methods and by fitting the war surplus 90 h.p. R.A.F. 1A eight cylinder aircooled engine, available in vast numbers at the ridiculous price, it is said, of 14s. 6d. each. The aircraft was a two bay biplane of typical de Havilland appearance with plywood covered fuselage, ball bearing controls and the standard oleo damped undercarriage. With differential ailerons on the bottom mainplane only and a spring loaded elevator instead of the traditional tail trimming gear, the D.H.51 was the true forefather of the later Moth series.

The company was convinced that privately owned aircraft should be able to climb easily out of small fields and by fitting an 8 ft. 9 in. four bladed wooden airscrew, a rate of climb of 580 ft./min. was achieved, or more than twice that of the little D.H.53 flown in the Lympne Trials. For sociability the D.H.51 was built as a three seater with the pilot in the rear cockpit for best possible view and two passengers in tandem in front. Ease of access to the front cockpit was ensured by omitting the port centre section incidence wires and by raking the rear struts backward to permit the fitting of a downward hinging door, later also a well known Moth feature. A curved sliding deck, or saddle piece, of the type first used on the D.H.37, carried the windscreen for each cockpit and when seated, the pilot could pull it towards him and so reduce the cockpit aperture and draughts. In the fully forward position the adjustable decking to the front

cockpit enabled two passengers to be carried, the front one on a canvas seat and the rear with dual control. When flown as a two seater the decking slid back to form a cockpit of normal size. As on the D.H.50, fuel was carried in a 30 gallon centre section tank which gave a range of 360 miles at cruising speed.

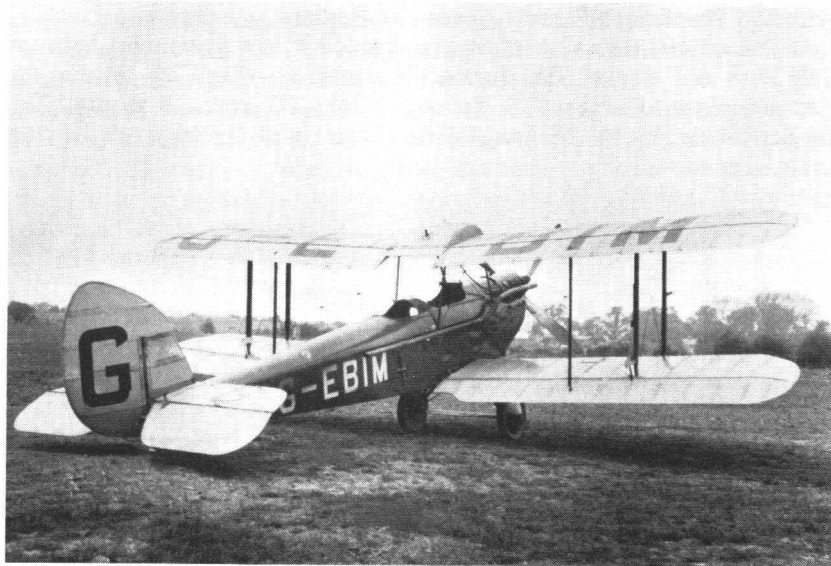
Capt. Geoffrey de Havilland made the first flight in the prototype D.H.51 on July 1, 1924 but in spite of the fact that the R.A.F. 1A engine had been a product of the Royal Aircraft Establishment, the airworthiness department of the Air Ministry would not grant a C. of A. because it had single ignition. Rather than bear the expense of 10 hours compulsory airborne type testing which would have followed the fitting of dual ignition, the de Havilland Company re-engined the D.H.51 with an Airdisco motor. This was a war surplus 80 h.p. Renault modernised by Maj. F. B. Halford of the Aircraft Disposal Co. Ltd., Croydon, to incorporate redesigned cylinder heads and valve gear which raised the output to 120 h.p. With this engine the D.H.51 had a very considerable performance but could no longer be offered cheaply and only two more were ordered. The first of these, the green and silver *G-EBIQ*, was delivered to Air Commodore J. G. Weir in time for the King's Cup Race of July 3, 1925 in which it was flown by Col. the Master of (later Lord) Sempill with the owner as passenger. Fog caused a precautionary landing and retirement at St. Albans, a fate shared by so many other competitors that a scratch race—the Croydon Stakes Consolation Handicap—to Blackpool and back via Filton and Shotwick, was organised on the following day. Sempill won this 520 mile race in *'IQ* which afterwards went north to be based with the Beardmore Reserve School at Renfrew, starting and finishing point of a 1,600 mile tour of Scotland made by the same pilot between July 29th and August 7th, during the course of which *'IQ* became the first aeroplane to land on the cliff top at John O'Groats. A month later, on September 4th, A. N. Kingwill flew it to Cramlington where he won



The D.H.51 prototype, c/n 100, in its original condition with 90 h.p. R.A.F. 1A engine. A. J. Cobham and W. L. Hope occupy the cockpits.



Airdisco engine D.H.51 *G-EBIQ*, c/n 101, of Taxiplanes Ltd. at its joyriding field, Brean Down, Weston-super-Mare in 1929. The front cockpit decking has been moved forward to make room for two passengers. (*W. K. Kilsby Photo.*)



The prototype aircraft in its D.H.51A configuration with single bay wings and full span, automatic, camber-changing flaps. (*P. T. Capon Photo.*)

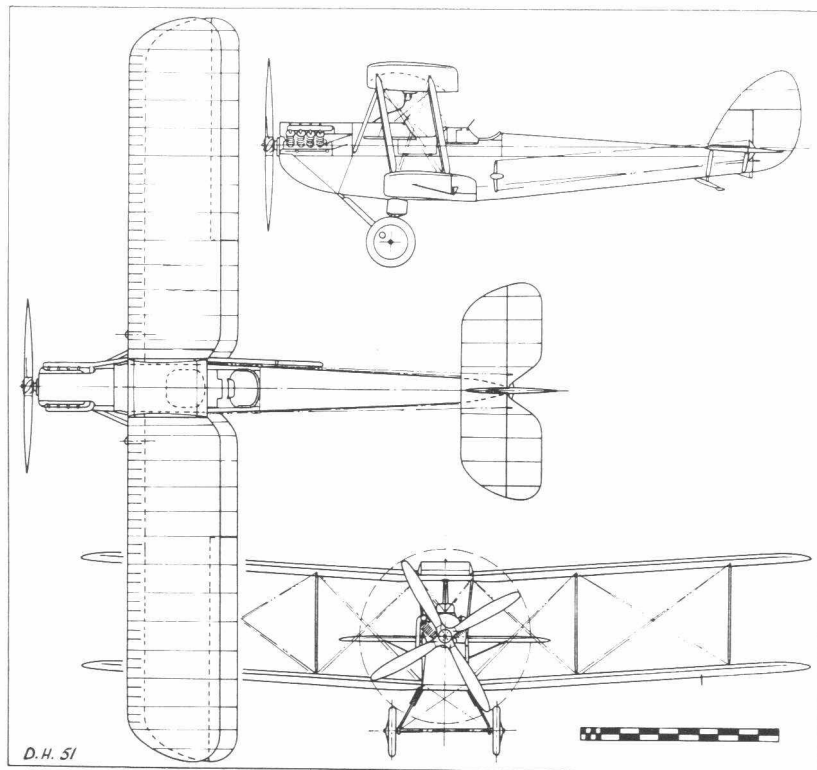
the Newcastle Aero Club's Private Owners' and Open Handicap Races. In August 1928 the aircraft was acquired by Taxiplanes Ltd. of Clevedon, Somerset, thereafter becoming very well known as a joyriding machine at Brean Down near Weston-super-Mare and at other west country resorts. L. G. Anderson, well known connoisseur of vintage aeroplanes, bought it in June 1931 and its career came to an end at Hanworth a year or so later.

Late in 1924 the prototype D.H.51 *G-EBIM* was fitted with new short span, single bay wings with fully automatic camber changing flaps, 83 sq. ft. in area, of the type which had proved so effective on the D.H.50. It was first flown in this condition as the D.H.51A on November 8, 1924 and in the following year was sold to F/O G. E. F. Boyes. With "Come on Steve" painted on the nose as a reminder that the entrant was the well known jockey Steve Donoghue, it competed against the standard D.H.51 *G-EBIQ* in the 1925 King's Cup Race. Piloted by C. D. Barnard and carrying two passengers, it eventually reached Newcastle but after two forced landings had lost so much time that Barnard retired. Two years later it was disposed of to the Golden Aviation Co. for pleasure flying at Mascot Aerodrome, Sydney, but in 1929 new owners A. S. Elkin and R. F. Walker fitted twin wooden floats and it flew as the sole D.H.51B until engine trouble forced it to alight and overturn in Sydney Harbour in 1931.

The third and last D.H.51 "Miss Kenya", was built in 1925 for John Carberry and, devoid of its allotted markings *G-EBIR*, was shipped to Mombasa on September 17, 1925. After covering the last stage to the owner's property at Nyeri by ox cart it was first flown by Carberry on April 4, 1926. His longest recorded flight in "Miss Kenya" was from Nairobi to Kisumu and back in February 1927 to pick up the Director of Civil Aviation, Sir Sefton Brancker, southbound from Khartoum in the North



"Miss Kenya" at Hatfield in Kenya markings before it went to Hawarden to receive the registration *G-EBIR* allotted almost 50 years previously. (*Aviation Photo News.*)



Sea Aerial and General Transport Co. Ltd.'s borrowed Fairey IID. In June 1928 Tom Campbell Black, G. Skinner and A. Hughes bought the machine and took it to Rumuruti and on September 10th it became *G-KAA*, the first aircraft on the Kenya register, but was not repainted until the present day system of Colonial registrations was instituted and it became *VP-KAA* on January 3, 1929. From 1933 until 1939 'AA was owned by D. A. G. Onslow at Kisumu but did not fly after the C. of A. expired on May 11, 1937. During the war it was dismantled and stored at Eastleigh, Nairobi, by ground engineer G. F. Baudet who re-erected and flew it after the war. He presented it to the R.A.F. but wrote off the undercarriage and inflicted other damage when landing at Eastleigh in gusty conditions at the end of the ferrying flight from Nairobi West in June 1951. The aircraft then remained semi-derelict in a hangar until late in 1954 when it was acquired by J. S. Le Poer Trench who reconstructed it with the help of A.R.B. surveyor J. A. Johnstone and E.A.A.C. engineer A. Watkins. The veteran flew again in 1955 and was then displayed statically and in the air at many local air displays. On January 7-8, 1956 it attended the Kitale Air Display, afterwards making the longest flight of its career 220 miles nonstop home to

Nairobi where it was kept at Wilson Field, carefully preserved with current C. of A. as the oldest airworthy design of the de Havilland Aircraft Co. Ltd.

In July 1965 *VP-KAA* was airfreighted to Hatfield in an R.A.F. Beverley and handed over to the Shuttleworth Trust for whom the airframe was stripped down and rebuilt to airworthy standards by Hawker Siddeley apprentices at Hawarden, Chester. The Airdisco engine was sent to Leavesden in 1967 for complete overhaul by apprentices at the Rolls-Royce small engine division. Carrying registration *G-EBIR* for the first time, it was restored to Shuttleworth trustee Air Commodore A. H. Wheeler who made the first post-restoration flight at Old Warden on March 15, 1973.

SPECIFICATION AND DATA

Manufacturers: The de Havilland Aircraft Co. Ltd., Stag Lane Aerodrome, Edgware, Middlesex

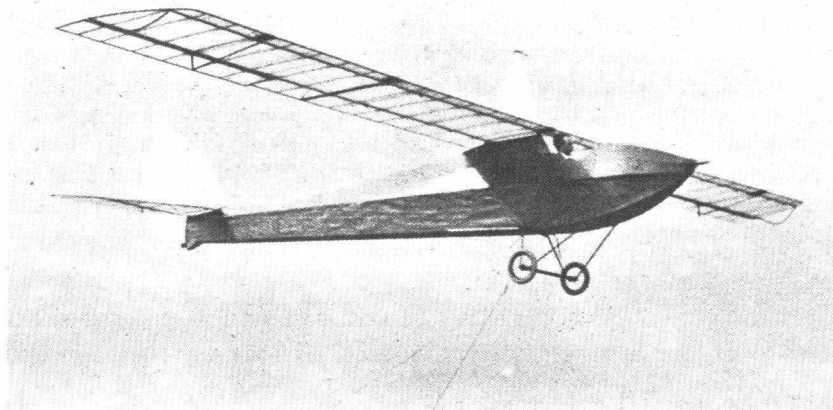
Power Plants: One 90 h.p. R.A.F. 1A
One 120 h.p. Airdisco

Dimensions, Weights and Performances:

	D.H.51		D.H.51A	D.H.51B
	R.A.F. 1A	Airdisco		
Span . . .	37 ft. 0 in.	37 ft. 0 in.	32 ft. 0 in.	37 ft. 0 in.
Length . . .	26 ft. 6 in.	26 ft. 6 in.	26 ft. 6 in.	29 ft. 2 in.
Height . . .	9 ft. 9 in.	9 ft. 9 in.	9 ft. 7½ in.	11 ft. 0 in.
Wing area . . .	325 sq. ft.	325 sq. ft.	296 sq. ft.	325 sq. ft.
Tare weight . . .	1,312 lb.	1,342 lb.	1,437 lb.	—
All-up weight . . .	2,240 lb.	2,240 lb.	2,240 lb.	2,240 lb.
Maximum speed . . .	94 m.p.h.	108 m.p.h.	105 m.p.h.	100 m.p.h.
Cruising speed . . .	80 m.p.h.	—	—	—
Stalling speed . . .	36 m.p.h.	43 m.p.h.	—	46 m.p.h.
Initial climb . . .	580 ft./min.	960 ft./min.	—	550 ft./min.
Ceiling . . .	13,000 ft.	15,000 ft.	—	12,000 ft.
Range . . .	360 miles	—	—	—

Production:

	Constructor's No. and Registration	C. of A. Issued	Remarks
100	<i>G-EBIM</i>	Nil	R.A.F. 1A, re-engined as below
100	<i>G-EBIM</i>	22.10.24	Airdisco, converted to D.H.51A as below
100	<i>G-EBIM</i>	1. 5.25	D.H.51A, sold in Australia 4.27 as <i>G-AUM</i> , overturned in Sydney Harbour 3.1.31
101	<i>G-EBIQ</i>	29. 6.25	First flown 27.3.25 by A. S. White; last flown at Hanworth 14.5.32 by L. G. Anderson
102	<i>G-EBIR</i>	12. 9.25	To Kenya 1926; <i>G-KAA</i> 9.28 and <i>VP-KAA</i> 1.29; restored to A. H. Wheeler, Old Warden 1973; flown again 15.3.73; Permit to Fly 23.3.73 and still airworthy in 1987.



The first D.H.52 "Sibylla" during initial trials with strutted undercarriage at Stag Lane.

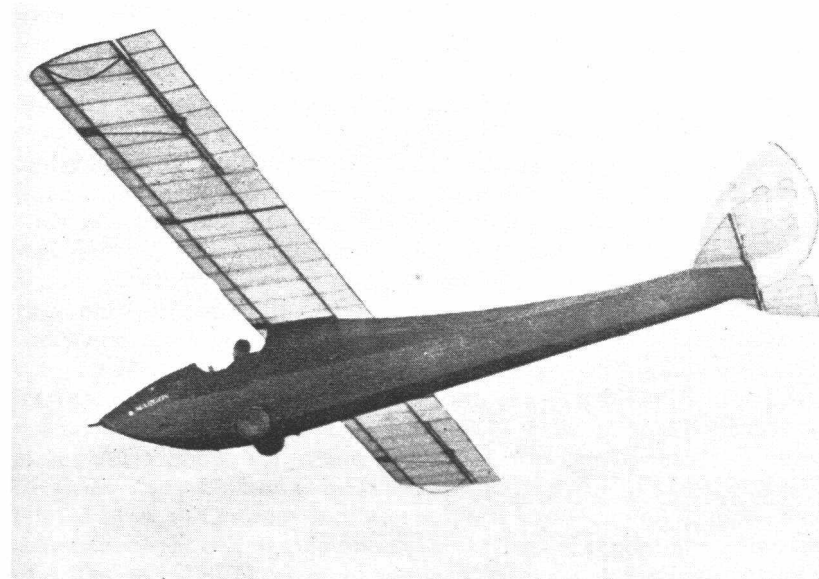
De Havilland D.H.52

The *Daily Mail* £1,000 Gliding Competition held in 1922 at Itford on the Sussex Downs, attracted 35 British and foreign entries, two of which were de Havilland D.H.52 single seat gliders. Built in September–October 1922, they were wire braced monoplanes with an aspect ratio of 11 to 1, in the design of which considerable ingenuity had been exercised to achieve maximum economy in weight. The fuselage was of typical de Havilland construction on a miniature scale, consisting of a box structure made up of thin spruce longerons and cross struts covered with 1 mm. plywood. This was surmounted by a light cambric covered fairing round the cockpit. The triangular section decking aft of the wing was made by stretching the same material over a cable tightly stretched between the wing mounting and the tail. Wing bracing was attached to a kingpost amidships and differential ailerons were fitted. The designers expected elevator control to be sluggish at the low air speeds involved and gave the elevators 90 degrees of upward and downward movement using leather hinges of the type found on the domestic clothes horse. A cross axle undercarriage of light steel tubing carried small scooter wheels and the cockpit was fitted with but one instrument—an air speed indicator calibrated down to 10 m.p.h.

Both D.H.52s were finished with clear dope flying surfaces and black fuselages, the first one being test flown at Stag Lane by Capt. Geoffrey de Havilland, H. S. Broad and A. J. Cobham during October 5–7, 1922. Initial trials established the landing speed at 18 m.p.h., after which the V undercarriage was replaced by a simple wheeled axle anchored to the

bottom longerons by shock absorber cord, and the angle of incidence of the wing was consequently increased. The second D.H.52 was completed with both these modifications and the two machines, delivered to Itford by road on October 15th, were erected inside a large marquee. The first, "Sibylla", entered by the de Havilland company and flown by H. S. Broad, received the competition number 4 and the second, "Margon", entered and flown by E. D. C. Herne, was numbered 33.

Broad was catapulted from Beddington Hill by a team of men with a rubber rope at midday on October 16th and in a flight lasting 2 minutes 18 seconds, gained a considerable altitude but damaged the glider in landing. Twenty minutes later Herne bettered this performance with a flight of 2 minutes 38 seconds but ran into a hedge and damaged the machine. Both flights revealed flexibility in the wing structure which twisted under load and neutralised the effect of the ailerons. By the 19th, Herne's aircraft had been repaired and to obtain better lateral control in the limited time available, had been converted to wing warping. The aircraft was launched just to the north of Itford but immediately the tow rope dropped off, the wing commenced uncontrolled warping which led to its sudden failure outboard of the centre section at an altitude of 20–30 ft. Fortunately the wreck fell to earth on an even keel and the pilot escaped with a shaking but after the accident it was suggested that although the mainplane had a factor of safety of 8 it was far too flexible for ailerons let alone warp control. There were no further flights and the two D.H.52 gliders were scrapped.



The second D.H.52 "Margon" flying with strutless landing gear.

In April 1923 drawings were prepared for a 37 ft. 8 in. span, tandem two seat glider similar to the D.H.53 Humming Bird which was to follow. This project, also designated D.H.52, was not proceeded with.

SPECIFICATION AND DATA

Manufacturers: The de Havilland Aircraft Co. Ltd., Stag Lane Aerodrome, Edgware, Middlesex

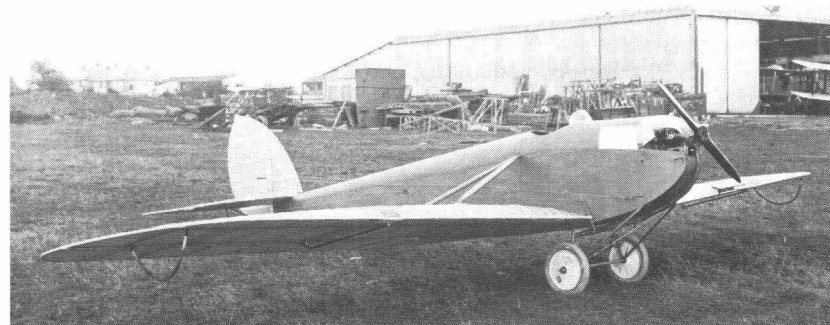
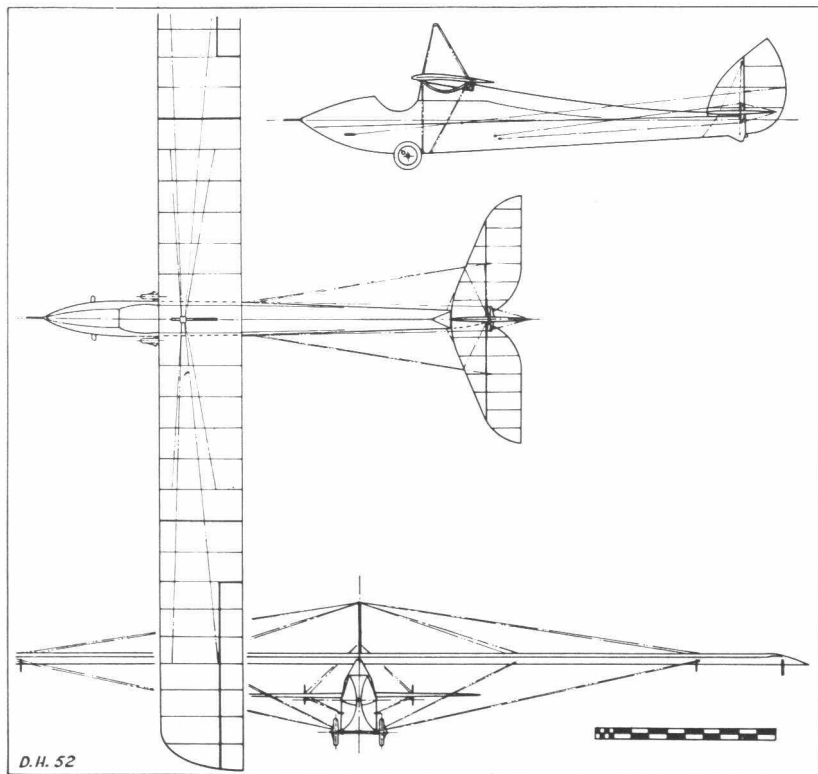
Dimensions: Span 50 ft. 0 in. Length* 28 ft. 0 in.
Height (with V undercarriage) 9 ft. 6 in.
(with wheels and axle) 8 ft. 0 in.
Wing area 220 sq. ft.

* Length 27 ft. 0 in. excluding nose mounted pitot head.

Weights: Tare weight 250 lb. All-up weight 400 lb.
Wing loading 1.82 lb./sq. ft.

Performance: Landing speed 18 m.p.h.

Production: Two aircraft only, no constructor's numbers.
No. 4 "Sibylla" damaged at Itford 16.10.22
No. 33 "Margon" crashed at Itford 19.10.22



The prototype D.H.53, c/n 98, in unpainted condition at Stag Lane on the day of its first flight. The engine was a 750 c.c. Douglas flat twin. (De Havilland Photo.)

De Havilland D.H.53 Humming Bird

The little D.H.53 low wing, single seat monoplane built for the *Daily Mail* Trials at Lympne in October 1923 was the first light aeroplane produced by the de Havilland Company. The main structural features of its larger forebears were retained, the fuselage consisting of the usual spruce longerons and cross struts covered with plywood while the fabric covered mainplane was of the standard two spar type but thickened at points where it was braced to the top longerons by sturdy wooden V struts. Two identical prototypes, "Humming Bird" owned by the company and "Sylvia II" by A. S. Butler, were piloted in the competitions by D.H. test pilot H. S. Broad and Maj. H. Hemming respectively. Their 750 c.c. Douglas motor cycle engines were a constant source of trouble and neither aircraft won a prize but Maj. Hemming's feat in covering 59.3 miles on one gallon of petrol and Broad's loops and rolls, never before performed on so small an aircraft, proved them the most practical aeroplanes present.

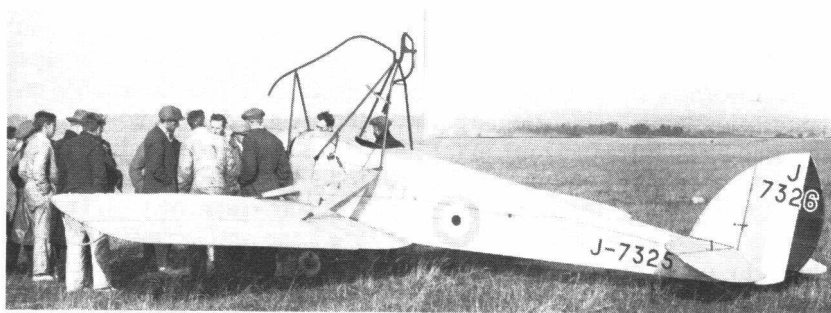
On its return to Stag Lane, the competition engine in "Humming Bird" was replaced by a small aero engine of proven reliability, the 26 h.p. Tomtit inverted V, two cylinder engine manufactured by Burney and Blackburne Engines Ltd. of Bookham, Surrey. The unsatisfactory bungee shock absorbers were at the same time replaced by miniature rubber-in-compression units. The standard fuel capacity of 2 gallons was also increased by an extra fuel tank in the form of a streamlined headrest fitted behind the cockpit to enable the machine to fly to Brussels for exhibition at the Aero Show, for which purpose it was re-christened "L'Oiseau Mouche". Now lettered G-EBHX it left Stag Lane on December 8, 1923 piloted by A. J. Cobham and after stops at Croydon and Lympne made a nonstop flight of 150 miles direct to the Belgian capital in a flying time of 4 hours at a fuel cost of 10 shillings. With the new engine it was no longer the hesitant ultra light and again piloted by Cobham, came eighth



The prototype D.H.53 with 26 h.p. Blackburne Tomtit engine and extra fuel tank for A. J. Cobham's Croydon-Brussels flight, December 8, 1923. (P. T. Capon Photo.)

at 67.35 m.p.h. in the 1924 Grosvenor Trophy Race at Lympne and took part with varying success in all the 1925 races, in which it was joined by the second prototype, now lettered *G-EBHZ*. This had been sold less engine in May 1925 to a group of seven officers at R.A.F. Eastchurch who flew as the Seven Aero Club, an enterprising fraternity headed by F/O G. E. F. Boyes who, with financial help from Lord Edward Grosvenor, fitted a 35 h.p. A.B.C. Scorpion driving a Fairey-Reed metal airscrew. The Scorpion blew a cylinder while racing in pouring rain at Lympne on August 1, 1925 and 'HZ ended on its nose in a wheat field but was flown again by Boyes at the Bournemouth Summer Meeting, August 21-22, 1926 and by F/Lt. A. L. A. Perry-Keene in the Grosvenor Challenge Cup Race at Lympne on September 18th, after which it was sold, probably as spares.

At a time of stringent economy, the Air Ministry became interested in the Tomtit engined D.H.53 and awarded de Havillands a contract for eight aircraft with the type name Humming Bird under Specification D. of R. 44/23. They were laid down at Stag Lane in March 1924 for communications and cheap practice flying, their permitted military load being 7 lb.! One machine, *J7272*, was shown in the New Types Park at the Hendon R.A.F. Display on June 28, 1924 prior to delivery to Northolt



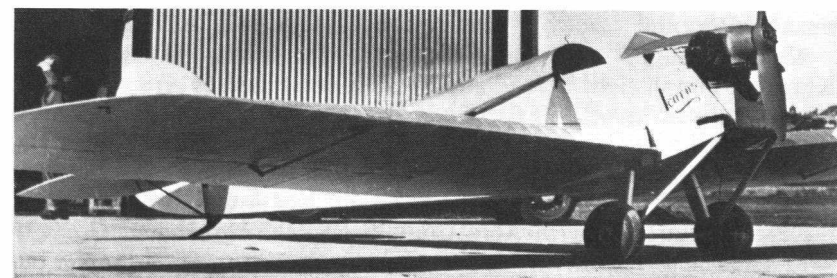
J7325, c/n 113, with airship pick-up gear. The rudder of its sister machine was a temporary fitment while its own was under repair.

the same evening. Three others were issued to C.F.S. Upavon, two to R.A.F. Netheravon and two to Farnborough for experimental use. An order for two D.H.53s was placed also by the Controller of Civil Aviation, Australia, the batch of 12 being completed by one for the Avia concern in Prague and one which A. S. Butler sent to Australia. Almost a year later a 13th machine was built to Russian order in accordance with the Soviet practice of acquiring single examples of the world's best aircraft.

The two Humming Birds for the Australian civil aviation authorities were despatched by sea in time for the Light Aeroplane Competition held at Essendon Aerodrome, Melbourne, from November 29-December 6, 1924 in which one of them piloted by Capt. E. J. Jones, forced landed so many times in the same field that it became known as Jones's Paddock. The same aeroplane was flown without success by Sqn. Ldr. Anderson in the Australian Aerial Derby held at Richmond Aerodrome, Sydney on January 8, 1925 but both machines enjoyed long and eventful careers which included service with the Aero Club of New South Wales. In the early '30s one was fitted with an A.B.C. Scorpion engine and in 1937 was shipped to Samoa. The purpose of the third Australian D.H.53, c/n 118, is obscure and it appears in neither civil nor R.A.A.F. records. It was acquired in wrecked condition by Dr. R. J. Coto in 1937. He rebuilt it from data, spruce, fabric and metal air mailed by de Havillands, fitted a



VH-UAC, c/n 103, first of the Australian D.H.53s, with cut-back front fuselage to accommodate the 35 h.p. A.B.C. Scorpion engine. (B. Van Sickle Photo.)



"Icarus", c/n 118, the D.H.53 fitted with 40 h.p. Aeronca engine in Australia by Dr. R. J. Coto in 1937.

40 h.p. Aeronca engine bought secondhand in England and named it "Icarus". With a 17 gallon fuel tank behind the cockpit he astounded the world in May 1937 by flying 1,950 miles from Wyndham to Perth, W.A. in 6½ days in an airborne time of 30 hours 5 minutes. Its hulk was burned at Perth in 1964. The eleventh production D.H.53 was despatched to Prague in June 1924 where it was ably demonstrated by H. S. Broad during the flying meeting which followed the Aero Exhibition. It was then sold to the Avia company for comparative flight trials with their own, similar, Avia B.H.16.

The first six D.H.53s for the R.A.F., numbered *J7268–J7273*, made their public debut when they took off together at the start of the race between the Air Ministry Directorates at the Hendon R.A.F. Display on June 27, 1925. They were thrown enthusiastically round the turning points of a five mile course to Mill Hill and back and it was said that the six Tomtit engines in unison sounded like desultory hand clapping. Their pilots were later to be famous, the winner being Wg. Cdr. W. Sholto Douglas (later Lord Douglas), representing Equipment. The others in order of finishing were Air Com. C. H. Longcroft, Personnel; F/Lt. W. C. Dickson, Intelligence; F/Lt. M. Thomas, Organisation; F/Lt. G. M. Bryer, Training (in *J7272*) and Wg. Cdr. H. N. Cave-Brown-Cave, Research and Development (in *J7273*). In the following November *J7272* was towed through the streets of London as part of the Lord Mayor's Show.

The seventh and eighth Service 53s *J7325–6* were specially modified for launching experiments from the airship *R-33 (G-FAAG)* piloted by F/Lt. Irwin, which left its mast at Pulham, Norfolk on October 15, 1925 carrying *J7325* attached to a special trapeze. At an altitude of 3,800 ft. Sqn. Ldr. R. de Haga Haig entered the cockpit from a ladder, the trapeze was lowered until the aircraft swung clear and a successful launch made. The D.H.53 dived until the engine started, performed two loops and returned to the airship and hooked on. At the end of a second experiment with the same aircraft on October 28th, turbulence near the dirigible's envelope caused the airscrew to foul a supporting wire at the moment of attachment, setting up severe oscillation which compelled the pilot to release and make a forced landing at Sarston. On December 4th, the attempt was repeated by the same pilot who successfully re-engaged the trapeze in *J7326* and rejoined the airship's crew.

No production D.H.53s were sold initially for private use in the United Kingdom but all eight R.A.F. aircraft were registered as civil aeroplanes when they were struck off Service charge in 1927 and six were granted Cs. of A. Several were made airworthy by P. G. N. Peters and his colleagues at the Royal Aircraft Establishment Aero Club, Farnborough which also owned *G-EBRW* in 1929 after 'Freddy' Gough had flown it for two years at the Norfolk and Norwich Aero Club, *G-EBXN* 1928–32 and *G-EBQP* 1927–28. The last mentioned had been *J7326* during its airship career but was fitted with a 32 h.p. Bristol Cherub III during its civil life. This began on August Bank Holiday 1927 when F/O McKenzie Richards came third in

the Nottingham Air Race and ended when an unlicensed pilot stalled at 60 ft. and killed himself at Hamble on July 21, 1934. The other D.H.53, which had successfully attached itself to the *R-33*, was acquired in crashed condition in April 1928 by Farnborough technician K. V. Wright by whom it was rebuilt and sold to Capt. A. V. C. Douglas at Bokesbourne in 1929. Others were flown by the Tellus Super Vacuum Cleaner Co. Ltd. at Brooklands, and by R. W. H. Knight at Hanworth.



D.H.53 *G-EBXN*, c/n 110, with 32 h.p. Bristol Cherub III at Hanworth in 1933.

The prototype *G-EBHX* was flown for many years by F. J. V. Holmes of Berkshire Aviation Tours before passing into the hands of E. W. Kennett at Walmer, Kent. After a lapse of almost 20 years it was rediscovered in 1955 in the back garden of a house in Eastrey, Kent, by Sqn. Ldr. L. A. Jackson of the Shuttleworth Trust. Only the fuselage, mainplane, port aileron and the undercarriage remained but although none of the original drawings existed, the missing engine mounting, tail unit, controls and tanks were designed and built at the de Havilland Technical School. Powered by an A.B.C. Scorpion engine, 'HX' made its first flight after rebuild at Hatfield on August 4, 1960 piloted by D.H. test pilot C. A. Capper. Handling trials, development flying and performance measurements followed, and the aircraft was handed over to the Shuttleworth Trust to be housed in airworthy condition at Old Warden, Beds. However, following a forced landing near Old Warden on August 31, 1980, caused by engine failure, 'HX' was relegated to static exhibit status.

Longest lived of the remaining D.H.53s were 'RW' flown at Broxbourne in 1933 by R. L. Burnett, and the Cherub engined 'XN', the last of whose seven owners was E. D. Ward at Hooton in 1938. Most flown of all Humming Birds, it was a familiar sight in its day at all the club aerodromes in the United Kingdom. The ultimate fate of many D.H.53s is obscure but it is known that one was converted into the R.A.E. Scarab (sometimes known as the P.B. Scarab) at Farnborough 1930–32, another was reconstructed as the Martin Monoplane at Denham in 1937, the year in which

a third was in the possession of R. J. Coley and Co. Ltd., scrap merchants at Hounslow, Middlesex. This is thought to have been the D.H.53 resurrected at Brooklands by students of the College of Aeronautical Engineering and flown by Capt. Duncan Davis in July 1936.

In 1987 a project to produce an airworthy Cherub III powered Humming Bird finished as J7326/G-EBQP complete with Airship pick-up gear was well advanced under the direction of M. C. Russell of the Russavia Collection. It incorporated many original D.H. 53 components recovered from the Martin Monoplane G-AEYY married to new fuselage built by the Hatfield Apprentices.

SPECIFICATION AND DATA

Manufacturers: The de Havilland Aircraft Co. Ltd., Stag Lane Aerodrome, Edgware, Middlesex

Power Plants: One 750 c.c. Douglas
One 698 c.c. (26 h.p.) Blackburne Tomtit
One 32 h.p. Bristol Cherub III
One 35 h.p. A.B.C. Scorpion
One 40 h.p. Aeronca

Dimensions: Span 30 ft. 1 in. Length 19 ft. 8 in.
Height 7 ft. 3 in. Wing area 125 sq. ft.

Weights: (Douglas) Tare weight 326 lb. All-up weight 524 lb.
(Tomtit) Tare weight 326 lb. All-up weight 565 lb.
(Cherub) — All-up weight 625 lb.
(Scorpion) — All-up weight 647 lb.

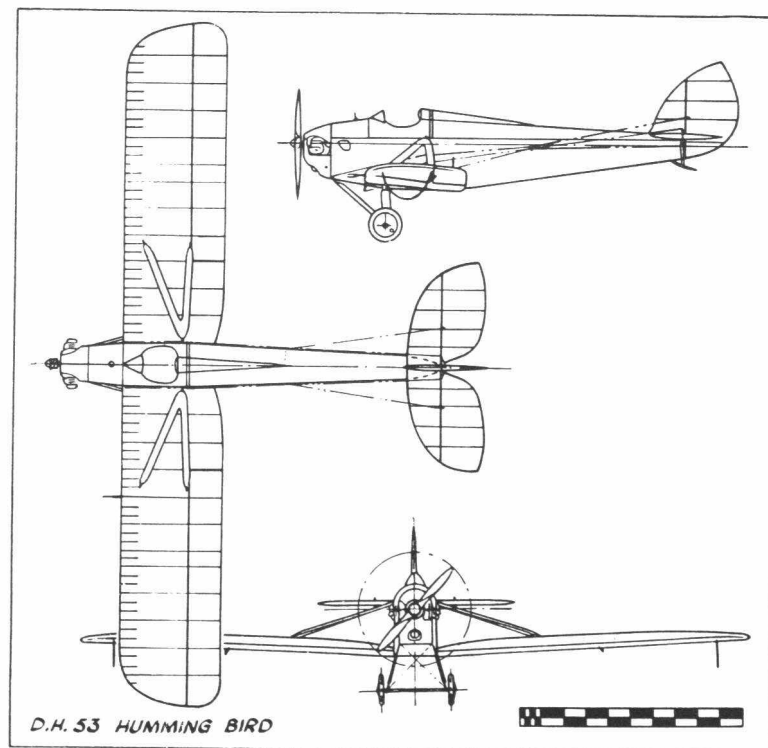
***Performance:** Maximum speed 73 m.p.h. Cruising speed 60 m.p.h.
Landing speed 33 m.p.h. Initial climb 225 ft./min.
Ceiling 15,000 ft. Range 150 miles

* With Tomtit engine

Production:

Constructor's No. and Registration	C. of A. Issued	R.A.F. Serial	Remarks
98 G-EBHX	28.10.37	Nil	First prototype, first flown 2.10.23, presented to the Shuttleworth Trust 1.9.60
99 G-EBHZ	Nil	Nil	Second prototype, first flown 1.10.23, scrapped 1927
103 G-AUAC	23. 6.24	Nil	Despatched to C.C.A., Australia 25.4.24, became VH-UAC in 1928, later fitted with Scorpion and sold in Samoa 6.37
104 G-AUAD	23. 6.24	Nil	Despatched to C.C.A., Australia 12.5.24, became VH-UAD in 1928, fitted with Cherub engine 1935
107 G-EBRW	25. 6.27	J7268	Delivered to Upavon 16.6.24, civil conversion 1927 by F/Lt. D. V. Carnegie, scrapped 1937
108 G-EBRJ	28.11.27	J7269	Delivered to Upavon 13.6.24, civil conversion 1927 by E. R. Wilson, scrapped at Woodley 1930
109 G-EBRA	Nil	J7270	Delivered to Netheravon 27.6.24, civil conversion abandoned, sold abroad 1.30
G-EBXN	25. 5.28	J7271	Delivered to Netheravon 27.6.24, civil conversion with Cherub 1928, destroyed in hangar fire at Hooton 8.7.40

111	G-EBTT	Nil	J7272	Delivered to Northolt 28.6.24, civil conversion abandoned 1928; believed sold to J. K. Lawrence, Cramlington 1931 as G-ABPS but again not converted
112	G-EBRK	4. 6.29	J7273	Delivered to Upavon 6.24; to D.T.D. Flight, Farnborough 4.5.25; civil conversion by R. N. Thompson 1929, crashed 3.32
113	G-EBXM	26. 5.28	J7325	Delivered to R.A.E. 16.2.25, first airship machine, civil conversion by K. V. Wright, withdrawn at Brooklands 8.31, believed rebuilt by College of Aeronautical Engineering 1936
114	G-EBQP	13. 5.27	J7326	Delivered to R.A.E. 30.3.25, second airship machine re-engined with Cherub III, crashed at Hamble 21.7.34
117	—	Nil	Nil	Sold to Milos Bondy a Spol "Avia", Prague, 6.24, Tomtit engine, flown by Broad at Kbely 26.6.24
118	—	15. 7.24	Nil	To Australia 7.24; fitted with Aeronca engine 1937, named "Icarus"; burned at Perth Technical College, W.A., in 1964
152	—	12.12.24	Nil	First flown by Broad to 10,000 ft. 29.12.24; sold in Russia 1.25, Tomtit engine





The D.H.54 Highclere G-EBKI, c/n 151, at Croydon in 1926. (*Imperial Airways Photo.*)

De Havilland D.H.54 Highclere

In 1924, when the outstandingly successful D.H.34 had been carrying the major portion of British airline responsibility for over three years, a larger successor was designed to Air Ministry Specification 40/22. Although structurally similar to its predecessor, the new D.H.54 Highclere carried the upper mainplane on centre section struts and was rigged with dihedral on the lower mainplane only, resulting in a marked reduction in gap towards the wing tips. Two crew occupied an open cockpit forward of the wings and 12 cabin passengers were carried in four single seats on the starboard, or door, side with eight in double seats to port. The aircraft was powered by a 650 h.p. Rolls-Royce Condor IIIA mounted as a detachable power plant with internal radiator and controlled cooling.

Consultations between de Havillands, D.H.34 operators and pilots, and an analysis of data obtained from the D.H.18 ditching experiment (see page 161), led to the incorporation of several unique features. Criticism having been levelled at the D.H.34 on account of its high landing speed, the D.H.54 was equipped with full span, automatic camber-changing flaps of the type tested on the D.H.50 and D.H.51A. The undercarriage employed rubber-in-compression shock absorbers and could be jettisoned to facilitate a smooth alighting on water in the event of engine failure. The bottom of the fuselage and the cabin door were also made watertight. Large area, anti-claustrophobic sliding windows were retained, but the luggage was housed in a special hold underneath the pilot's cockpit to permit lavatory accommodation to be provided in the rear fuselage. Hot air for cabin heating was drawn from a muff round an exhaust pipe and a Bristol gas starter was fitted to the Condor in view of the impossibility of swinging the 14 ft. diameter, four bladed, wooden airscrew. The prototype, built to Air Council order, made its first flight at Stag Lane piloted

by H. S. Broad on May 28, 1925. Very few teething troubles were experienced and before the day was out the D.H.54 had carried a number of privileged passengers. After familiarisation flights by R.A.E. test pilots at Hendon on June 25–26th, the machine made its public debut on the 27th in the New Types Park at the Hendon R.A.F. Display where an announcement was made that the D.H.54 was to be evaluated on the cross Channel services of Imperial Airways Ltd. Manufacturer's trials continued during the rest of 1925 and on July 31st Capt. Geoffrey de Havilland flew the Maharajah of Jodhpur and his polo team from Stag Lane to Croydon in it. The next day H. S. Broad gave passenger flights and other demonstrations at the Lympne Bank Holiday race meeting, later causing considerable amusement by racing with a full complement of passengers against A. J. Cobham in a Moth and just winning at an average speed of 103.4 m.p.h.

At the conclusion of Martlesham Trials in the following year the D.H.54 was cleared for a full certificate of airworthiness but by that time Imperial Airways Ltd. had announced that in future, passengers would only be carried in multi-engined aircraft. On March 7, 1926 therefore, the D.H.54 was flown from Martlesham to the R.A.E., Farnborough where it was used initially by the Acoustics Section, probably on sound locating experiments, and later for tests on its automatic wing flap mechanism. On November 9th it was transferred to Croydon for use on Imperial Airways freight services but a C. of A. was not issued until April 23, 1926 and little flying was done. Between May 5th and 17th H. S. Broad took it to Berck and Paris and back but forced landed at Le Touquet, and on his return flew it over to Farnborough.

During this period a scheme was considered for adapting it to carry standard 20 ft. × 13 in. steel water pipes under the designation D.H.54A. The door would have been enlarged to facilitate loading and three strengthened frames in the cabin structure were to have been fitted with suitable hoists. To keep within the maximum permissible gross weight, the load would have been restricted to three pipes, two carried one above the other on a strengthened floor on the port side and one to starboard. The conversion was never made and plans to use the D.H.54 as a freighter



The D.H.54 Highclere, G-EBKI, at Martlesham Heath for airworthiness trials, November 1925.

ended abruptly at Croydon on February 1, 1927 when its hangar collapsed during a heavy snowstorm. This worthy but outmoded prototype was thus damaged beyond repair without having flown a single Imperial Airways service. The Air Ministry was at that time under fire for refusing to allow the company to use the new hangars on the east side, and great was the jubilation when one of its own aircraft was destroyed through inadequate hangarage.

SPECIFICATION AND DATA

Manufacturers: The de Havilland Aircraft Co. Ltd., Stag Lane Aerodrome, Edgware, Middlesex

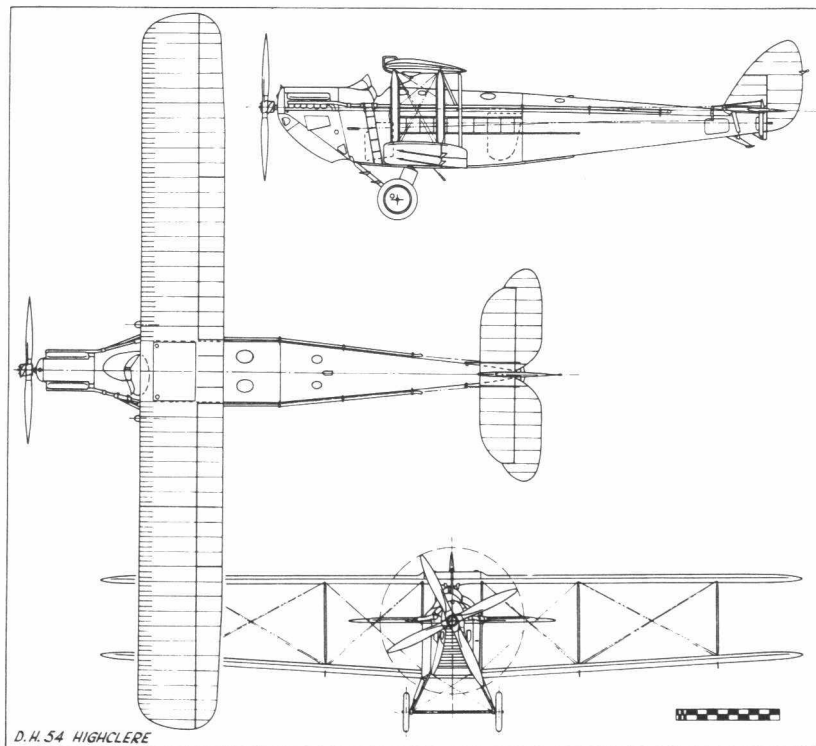
Power Plant: One 650 h.p. Rolls-Royce Condor IIIA

Dimensions: Span 68 ft. 2 in. Length 51 ft. 0 in.
Height 15 ft. 2½ in. Wing area 1,004 sq. ft.

Weights: Tare weight 6,768 lb. All-up weight 11,250 lb.

Performance: Maximum speed 110 m.p.h. Cruising speed 100 m.p.h.
Landing speed 52 m.p.h. Initial climb 580 ft./min.
Range 400 miles

Production: Prototype only; *G-EBKI*, c/n 151, first flown 18.6.24, C. of A. issued 23.4.26, damaged beyond repair at Croydon 1.2.27



The first prototype D.H.56 Hyena J7780, c/n 182, with 385 h.p. Armstrong Siddeley Jaguar III. (*De Havilland Photo.*)

De Havilland D.H.56 Hyena

This was a two seater developed from the all metal D.H.42B Dingo II to meet Army Co-Operation Specification 33/26. First flown by Hubert Broad on May 17, 1925, the Hyena was similar to the Dingo and featured the well known de Havilland rudder, differential ailerons, ball bearing controls and rubber-in-compression undercarriage. It was powered by a 385 h.p. Armstrong Siddeley Jaguar III, two row, aircooled radial engine driving a two bladed wooden airscrew equipped with Hucks starter claw. The engine was fitted with a close fitting cowlage which extended rearwards to fair it into the flat sides of the front fuselage. The unequal span wings, narrow chord lower mainplane and splayed out interplane struts of the Dingo were retained but partial push-rod control was introduced into the aileron circuit and over the tailplane to the elevator. Parasitic drag of wing tanks was eliminated by carrying 100 gallons of fuel in the fuselage ahead of the pilot and raising it to the centre section gravity tank by D.H. wind-driven pump, or in an emergency, by hand pump. Message pick-up gear was sited below the gunner's cockpit and the Hyena was also equipped for artillery spotting, photographic reconnaissance, supply dropping and ground attack, the bombs for which were carried in a rack under the port lower mainplane. Armament consisted of a synchronised, forward firing Vickers gun with a second gun of the same type on a Scarff mounting.

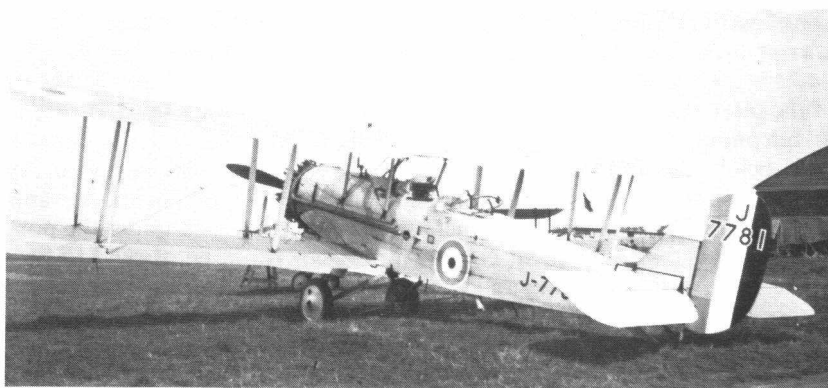
Two Hyenas were built, the first of which was shown in the New Types Park at the Hendon R.A.F. Display on July 3, 1926, but before it went to Martlesham, an uncowed Jaguar IV engine of 422 h.p. was fitted, complete with Bristol gas starter and a neat circular manifold with long exhaust pipes of the type used on the D.H.9J. The second Hyena, ready for test flight by



D.H.56 Hyena J7780 at Martlesham in 1926 with uncowed Jaguar IV engine.

June 29, 1926, was exactly similar to the first in its modified condition with uncowed Jaguar IV and long exhausts and was delivered to Farnborough by Broad on August 8, 1926.

After competitive trials between the second Hyena J7781 and the A.W. Atlas, Bristol Boarhound and Vickers Vespa prototypes (*G-EBLK*, *G-EBLG* and *G-EBLD* respectively) at the A. & A.E.E., Martlesham Heath, all four were ferried to Manston for assessment by No. 2 Army Co-Operation Squadron. J7781, which arrived there on August 19, 1926, was put through its paces by F/O A. H. Wheeler and others before being flown to the School of Army Co-Operation at Old Sarum, and later to Andover, Odiham and No. 4 Army Co-Operation Squadron, Farnborough, for



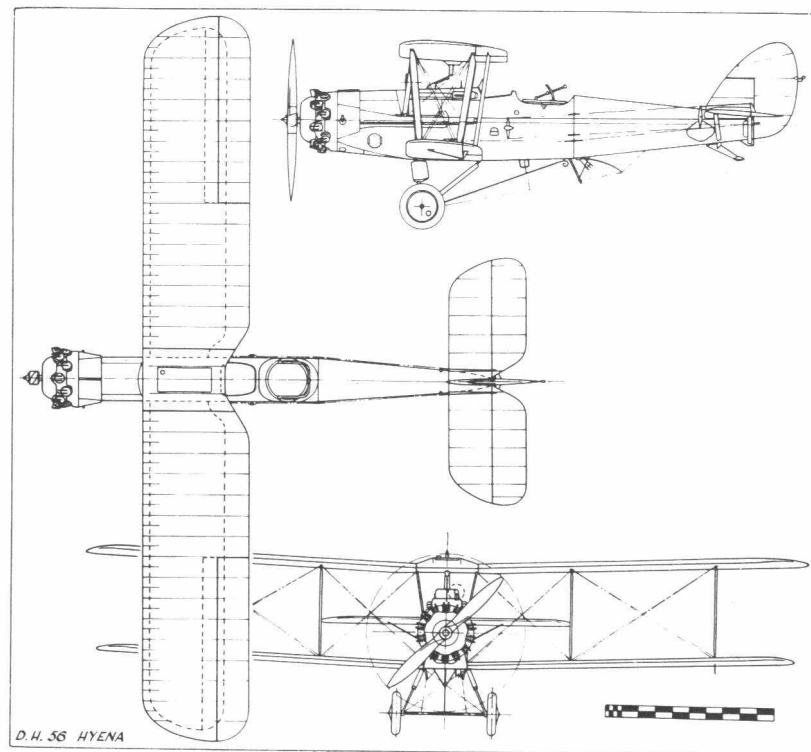
The second prototype D.H.56 Hyena J7781, c/n 195, showing the long exhaust pipes of the Jaguar IV installation.

Service evaluation alongside its competitors which led to the production contract being awarded to the Atlas.

Hyena J7781 also co-operated in field exercises performed by O.T.C. cadets in camp at Tidworth Park, and in September 1927 was transferred to the R.A.E. Engine Flight, Farnborough, where tests on its exhaust system were still in progress in May 1928.

SPECIFICATION AND DATA

<i>Manufacturers:</i>	The de Havilland Aircraft Co. Ltd., Stag Lane Aerodrome, Edgware, Middlesex	
<i>Power Plants:</i>	One 385 h.p. Armstrong Siddeley Jaguar III One 422 h.p. Armstrong Siddeley Jaguar IV	
<i>Dimensions:</i>	Span (upper) 43 ft. 0 in. (lower) 41 ft. 5½ in. Length (Jaguar III) 29 ft. 11 in. (Jaguar IV) 29 ft. 9 in. Height 10 ft. 9 in. Wing area 421½ sq. ft.	
<i>Weights:</i>	(Jaguar III) Tare weight 2,247 lb. All-up weight 3,962 lb. (Jaguar IV) Tare weight 2,399 lb. All-up weight 4,200 lb. Military load 417 lb. Total load 1,476 lb.	
<i>Performance:</i>	Maximum speed 130 m.p.h. Speed at 10,000 ft. 122 m.p.h.	
<i>Production:</i>	Two aircraft only: J7780, c/n 182, and J7781, c/n 195	





The famous prototype D.H.60 Moth *G-EBKT*, c/n 168, with unbalanced rudder and starboard exhaust. Photograph shows A. J. Cobham leaving Stag Lane en route to Croydon and Zürich on May 29, 1925. (*De Havilland Photo.*)

De Havilland D.H.60 Moth

Even though the D.H.53 Humming Birds were the most practical aeroplanes at the 1923 Lympne Trials and later attracted an Air Ministry production contract, Capt. Geoffrey de Havilland recognised that none of the Lympne entries would make the ideal club or private aeroplane of the future. For this reason there was no de Havilland machine at Lympne a year later to take part in Air Ministry trials for two seaters fitted with engines of less than 1,100 c.c. as the ill-conceived rules of this competition could only give rise to a number of moderately successful ultra lights, severely underpowered and also handicapped by the uncertain behaviour of their engines. Breaking completely away from contemporary concepts therefore, the team at Stag Lane built a scaled down version of the D.H.51 and produced a two seat light biplane capable of withstanding the hard knocks of instructional work, large enough and comfortable enough for cross country flying, and powered by a dependable engine. This was specially designed by Maj. F. B. Halford of the Aircraft Disposal Co. Ltd. using one half of the firm's 120 h.p. Airdisco 8 cylinder V type engine, mounted on a new crank case and giving 60 h.p. for a weight of 290 lb. The engine was christened Cirrus I and the aircraft, designated D.H.60, was given the type name Moth in deference to Capt. de Havilland's reputation as a lepidopterist.

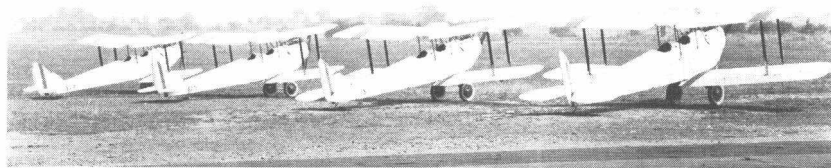
The sturdy simplicity of the Moth was a revelation. Its fuselage was a plywood box built round four square section spruce longerons, with the flat sides and bottom stiffened by vertical and horizontal cross members screwed to the plywood because years of operational experience had shown

this type of construction not only capable of withstanding rough usage but economical to produce in small numbers. Two occupants sat in tandem, the front cockpit being fitted with a generous luggage shelf under the decking. The engine was bolted to the top longerons in an elevated position where the cylinders protruded prominently from the close fitting cowling. There was no oil tank, all oil, amounting to $1\frac{1}{2}$ gallons, being carried in the engine sump. The centre section, built up of four vertical and two sloping, streamlined section hollow steel struts, supported a 15 gallon fuel tank of aerofoil section. Rear undercarriage legs of entirely new design were in the form of telescopic tubes sprung by rubber blocks in compression, anchored vertically below the front centre section struts with radius rods forward to the foot of the fireproof bulkhead. Large diameter wheels with narrow tread, high pressure tyres were fitted to a straight steel axle.

Wing construction comprised I section spruce bars spindled from the solid, with built up ribs and rounded wing tips of slightly flattened aluminium tube, the whole being fabric covered. A single bay layout employing wide chord interplane struts, and an abnormally great wing tip overhang, was rigidly braced by streamline wires. For ease of housing, the wings folded about the rear spar to reduce overall width to that of the tailplane, viz. 9 ft. 8 in. Folding was effected by spring loaded quick release bolts in the root end fitting of the front spar and the insertion of a temporary jury strut to support the inner end of the wing cellule. Differential ailerons were fitted only to the lower mainplane, the rudder was unbalanced and full dual control was installed. A tail trimming lever on



Production Cirrus I Moth *G-AUAJ* with balanced rudder and port exhaust pipe, in service with the N.S.W. section, Australian Aero Club, at Mascot, Sydney on September 5, 1928. (*J. G. Reed, by courtesy of QANTAS.*)



Irish Air Corps Cirrus I Moths, serials 23-26, awaiting delivery from Stag Lane to Baldonnel in 1926.

the left varied the amount of assistance given to elevator control by a powerful spring under the rear seat. Instruments were reduced to bare essentials and twin brass household-type, tumbler-ignition switches were mounted externally.

The first flight of the now famous Moth prototype *G-EBKT* was made by Capt. Geoffrey de Havilland at Stag Lane on Sunday, February 22, 1925. Its simple lines and outstanding performance on low power set an instantly popular fashion in light aeroplane configuration which lasted for several decades. Comparable in weight and wing area to the D.H.2 of ten years previously, it was nearly as fast and carried two people on half the power. Enthusiastic efforts on the part of the Director of Civil Aviation, Sir Sefton Brancker, resulted in the founding of five Air Ministry subsidised, Moth equipped flying clubs. The first club Moth *G-EBLR* was delivered to the Lancashire Aero Club, Woodford, by A. J. Cobham on July 21, 1925 and he ferried the eighth, *G-EBLV*, to the same destination on August 29th. Sixty-two years later, in 1987, 'LV' was still kept in full flying condition by British Aerospace at Hatfield as the oldest example of the type which first brought financial success to its predecessor, the de Havilland Aircraft Co. Ltd., whose apprentices had rebuilt it for this purpose in 1951.

The London Aeroplane Club, Newcastle Aero Club, the Midland Aero Club and the Lancashire Aero Club were each allotted two Moths and two more went to the Yorkshire Aeroplane Club the first of which was ferried to Sherburn-in-Elmet by R. W. Kenworthy during a memorable summer which saw the birth of the British flying club movement.



Four Cirrus II Moths, J9113-J9116, with D.H.60X modifications but straight axle undercarriages, supplied to the Air Ministry in 1928.



H. S. Broad flying the U.S.A. demonstration Moth, c/n 273, fitted with Short Mussel twin float undercarriage at Rochester in November 1926. ('Flight' Photo 4155.)

On May 29, 1925 the Moth made headline news when A. J. Cobham flew 'KT 1,000 miles from Croydon to Zürich and back in a day. At 6 a.m. on July 3rd he took off from Croydon in the same aircraft in company with the second Moth 'KU flown by Capt. Geoffrey de Havilland at the start of the King's Cup Race. Both made precautionary landings in fog north of London but later in the season figured prominently in race meetings at Lympne and Bournemouth. By the end of the year the first private Moths had been sold to G. B. H. Mundy and W/Cdr. A. Wynn and evaluation orders were received from early purchasers of the D.H.53, the Controller of Civil Aviation, Australia, and the R.A.A.F. One Moth was exported to Chile.

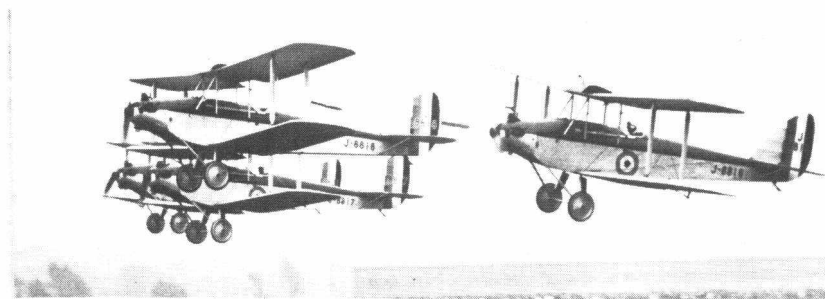
Although initially flown with clear doped wings, unbalanced rudder and exhaust pipe on the starboard side, the prototype Moth was modified to production standard with silver wings, horn balanced rudder and the exhaust pipe on the port side. Twenty Moths were built in 1925 but 1926 models, commencing with the Air Ministry's trials Moth J8030, were fitted with a locker behind the rear cockpit instead of the front luggage shelf. During 1926 35 Moths of this type were built, including two more for the Air Ministry, 14 for private owners and flying clubs at home, six for flying clubs in Australia, three for QANTAS, one for Japan, four for the Irish Air Corps and an exhibition aircraft. Piloted by H. S. Broad, this, the first Moth seaplane, flew from the Medway at Rochester in November 1926 fitted with the all metal, twin float undercarriage originally fitted to the Short Mussel *G-EBMJ*. Cobham took this machine by sea to the U.S.A. where arrangements were being made for Moth production. He flew the last few miles from Sandy Hook to New York, landed in the harbour and later refitted the wheels for demonstration before members of Congress. Private Moth *G-EBNX*, flown in England in 1926 by parachute inventor Leslie Irvin, also went to the United States.

For the 1926 King's Cup Race, Maj. Halford produced a developed engine of 85 h.p. for Capt. de Havilland's mount *G-EBNO* and called it the Cirrus II. A broken oil pipe ruined its chances and H. S. Broad won the race in a Cirrus I Moth *G-EBMO* at an average round-Britain speed of 90.5 m.p.h. The first production Cirrus II engine was later fitted to this machine for a 5,540 mile flight to India by T. Neville Stack, who, accompanied by B. S. Leete in the second prototype Moth 'KU', left Croydon on November 16th. They were the first Moths in the sub-Continent and attracted much attention during a joyriding tour to Rawalpindi, Lahore and elsewhere until 'KU' crashed at Calcutta in the following July.

To comply with the rules of the 1926 *Daily Mail* two seat light aeroplane trials at Lympne, a special light weight machine was fitted with a 75 h.p. Armstrong Siddeley Genet I radial. It was flown with competition number 2 by H. S. Broad who was disqualified, but as *G-EBOU* it competed in several club races piloted by Sempill, d'Arcy Greig and others until F/O F. O. Soden bought it as an aerobatic mount in 1927.

Following motor car practice, there was a 1927 model of the Moth having reduced gap and a 1 ft. increase in span. It was also fitted with a Cirrus II engine to improve payload and cruising speed but the thrust line of the engine was lowered to decrease drag and improve forward view by bringing the cylinder heads more into line with the fuselage decking. These modifications were first made to *G-EBNP* under the designation D.H.60X although production machines, commencing *G-EBPM*, were known simply as Cirrus II Moths, some 150 of which were delivered in 1927. One of the first, *G-EBPP*, was shipped to Perth, W.A. by Maj. Hereward de Havilland who flew it across the continent to Melbourne and there rented a shed in Whiteman Street in which to assemble imported Moths. *G-AUFT*, supplied to the *Sydney Sun* for the distribution of pictures of the opening of the city of Canberra, was the first of 18 Moths erected in 1927 and towed through the streets to be test flown at Essendon Aerodrome before delivery to the clubs, the Bush Church Aid Society (*G-AUGM* "Far West"), West Australian Airways (*G-AUGO*) and other purchasers. The first aeroplane ever registered in Portugal was Cirrus II Moth *C-PAAA*, delivered via Croydon on August 9, 1927 to Senor Carlos Bleck who flew it from Lisbon to Portuguese West Africa in January 1928.

The British civil market absorbed 50 Cirrus II Moths that year and the famous Moth garages could be rented from de Havillands at Stag Lane. One aircraft, *G-EBQJ*, originally a seaplane, was sold to D. M. M. Rooke who left Croydon on May 24, 1927 to fly to Australia for a wager. An eventful flight brought him to Bengal where the machine struck a palm tree on take off from Aurangabad on August 14th and was destroyed. W. L. Hope of Air Taxis Ltd. won the King's Cup at Hucknall on July 30th at an average speed of 92.8 m.p.h. in an early Cirrus I Moth *G-EBME* which had had the centre section tank removed, a special tank fitted in the front cockpit, smaller wheels and a racing windscreen. The new model



The Central Flying School's Genet Moth aerobatic team taking-off at the Hendon R.A.F. Display, July 2, 1927.

won its first laurels on July 5th when Lady Bailey established a new light aeroplane altitude record of 17,283 ft. over Stag Lane in *G-EBQH*. Others made pioneer long distance flights, such as the two return trips totalling 51,652 miles to Cape Town made in 1927-29 by Lt. R. R. Bentley in *G-EBSO* "Dorys". The more powerful Cirrus Hermes engine was fitted on the second occasion and *G-EBUF*, flown for S. Smith and Sons Ltd. by T. Neville Stack, and D. de Ferranti's *G-EBRX* were also fitted with this engine. The most widely publicised long distance flight by a Cirrus II Moth however was that of Lady Bailey who left Croydon for the Cape on March 9, 1928 in *G-EBSF*, only to write it off at Tabora on April 8th. Undaunted she successfully completed a solo flight of 18,000 miles to, round and from South Africa in a replacement machine *G-EBTG* fitted with the engine salvaged from 'SF'. To underline the ease of handling a Moth, Lt. Cdr. H. C. Macdonald made an unobtrusive flight to Baghdad in *G-EBVX* with only eight hours solo experience. Several went overseas with British owners, two of which *G-EBUJ* and 'UK' were seaplanes operated by the Singapore Flying Club. The Aircraft Operating Co. Ltd. also used a Cirrus II Moth seaplane 'XU' for a 450 square mile aerial survey of Rio de Janeiro.

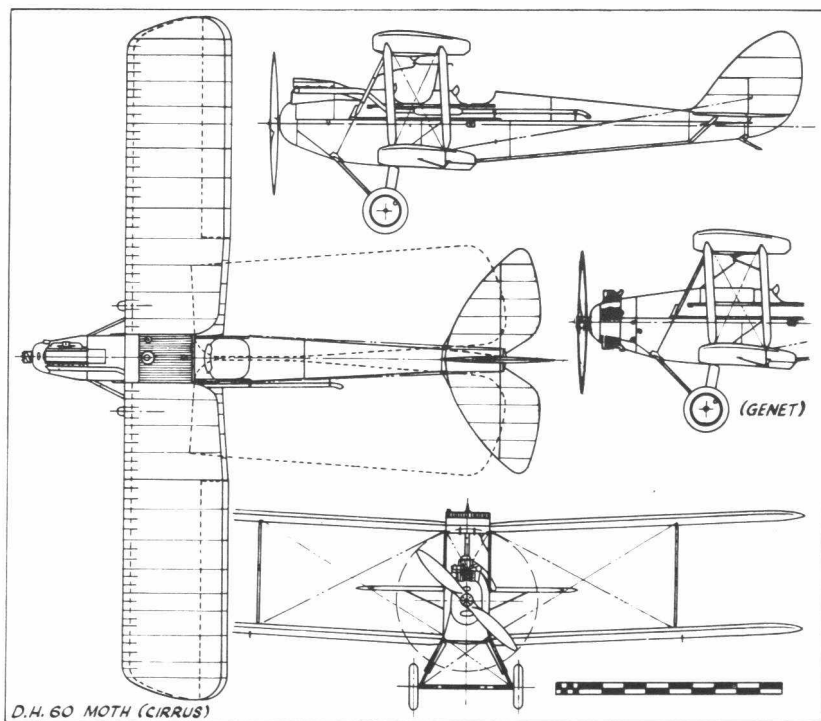
Six, numbered *J8816-21*, with 75 h.p. Armstrong Siddeley Genet I radials, were supplied to the R.A.F. for use at the Central Flying School. All took part in the Hendon R.A.F. Display of July 2, 1927, crazy flying on *J8820* by Sqn. Ldr. Smart being long remembered. The others performed formation aerobatics in the hands of C.F.S. instructors, four of whom were a future Schneider Trophy team—F/Lt. d'Arcy Greig D.F.C., and P/Os G. H. Stainforth, R. L. R. Atcherley, H. R. D. Waghorn and A. E. Beilby. *J8818*, first of this batch, was later placed at the disposal of the Director of Civil Aviation, Sir Sefton Brancker, who flew it with the special markings *G-EDCA* until 1928. It was then replaced by a Cirrus II Moth with the same markings, last aircraft of a batch of twenty (*J9103-J9122*) supplied to the Air Ministry for instruction at C.F.S. and communications with No. 24 Sqn., Hendon. When eventually struck off charge at the end of 1930, two of these became civil with Gipsy I engines.

United States Navy Requisition No. Aero 238 for the Fiscal Year 1927, records that 4,316 dollars were set aside for the purchase of one Moth, which, with serial 7564, was issued to the U.S. Naval Attaché in London. It was based at Stag Lane and replaced the venerable DH-4Bs previously kept there, and remained in service until sold to the Midland Aero Club as *G-AADB* at the end of 1928.

On April 2, 1928 Lt. L. G. Richardson, a Blackburn Dart pilot serving in H.M.S. *Furious*, became the first person to land a British civil aircraft on an aircraft carrier when he flew from Gosport to join the ship off Portsmouth in his private Moth *G-EBPQ*.

Four aircraft were shipped to South Africa to Maj. A. M. Miller who assembled the first, *G-UAAA*, on the dockside at Cape Town and took off from the esplanade to make his historic tour of South Africa, covering 2,300 miles in eight days. Three other Moths were also imported in 1927, one each for the East London, Durban and Johannesburg Light Aero Clubs, the last mentioned being presented with *G-UAAL* by Sir Charles Wakefield who also donated *G-EBMQ* to the Lancashire Aero Club, one each to the Delhi and Singapore Flying Clubs and one to Maj. Gen. J. H. McBrien in Canada.

Canada welcomed the Cirrus Moth as the natural replacement for its



A standard Cirrus II Moth showing the lowered engine position. This example, 5359, c/n 547, was Grover Loening's entry in the Guggenheim Competition in New York in May 1928.

antique forestry patrol equipment, and in 1927 the Ontario Provincial Government imported the first examples fitted with alternative float and ski undercarriages and Fairey-Reed metal airscrews. They were erected in de Havilland Aircraft of Canada's first wooden hangar at Mount Dennis, Toronto along with 23 for the Canadian Ministry of National Defence and one each for Dominion Airways and Western Canada Airways. In the first three months of operation Ontario's first Moth seaplane *G-CAOU* flew 303½ hours on forestry patrol. In its first year Mount Dennis handled 62 Moths, some with Genet engines for the R.C.A.F. and one on floats with Cirrus II engine for reconnaissance duties with the Hudson Strait Expedition. This aircraft, *G-CAHK*, first Moth ever to arrive in Canada, left Halifax, Nova Scotia on July 27, 1927 aboard the icebreaker *Stanley* and was lowered overside four times during the voyage north to enable its crew, Sqn. Ldr. Lawrence and F/Lt. Leitch, to select camp sites ashore. A promising career ended when it capsized in a gale at Wakeham Bay, Hudson Strait on August 26th.

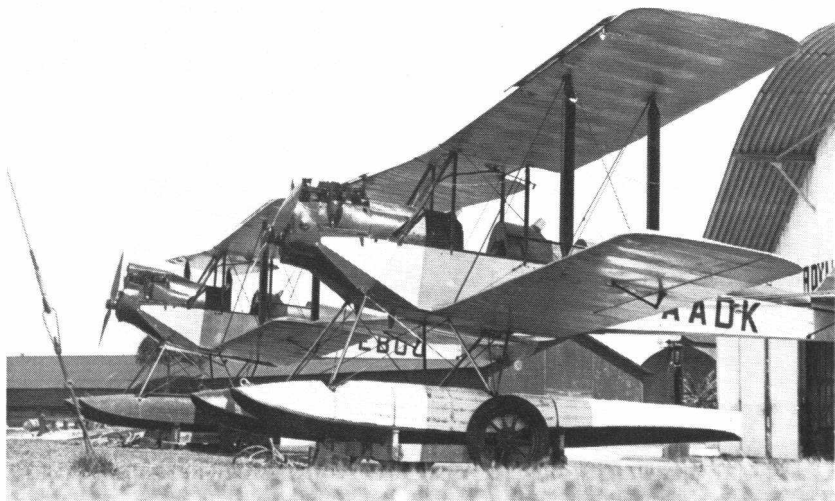


D.H. 60X Moth *G-CAUA*, built at Stag Lane for International Airways of Canada in 1928, after rebuild by D.H. of Canada employees for hand-over to the National Aviation Museum by owner C. F. Burke on May 10, 1963.

Four Moths were sold in the Argentine by Maj. S. G. Kingsley, former pilot of the River Plate Aviation Company's D.H.4A, D.H.6 and D.H.16, and sales were also made in Finland, Germany, New Zealand, Spain and Sweden (military designation Sk. 7). The Italian Air Ministry bought two for test purposes, and another was sold to the American aircraft designer Grover Loening. The latter's aircraft, 5359, was flown in the Guggenheim Safe Aircraft Competition at Mitchel Field, Long Island, New York on May 21–26, 1928 by the owner's pilot J. B. Taylor and competition test pilots Capt. T. Carroll and Lt. S. Umstead. In the far west John Carberry won the Speed and Efficiency Prize in his Cirrus II Moth *G-EBXP* at the Los Angeles Air Meeting in the following August, afterwards flying north to register the machine in Canada.

Public interest in the Moth's many racing successes and long distance flights was aroused to the point where the man-in-the-street called every small aircraft a 'Moth', just as every large aeroplane in the First World War had been a 'Handley Page'. Further improvements were made in 1928 when the new model, fitted with a new 90 h.p. Cirrus III engine could be identified externally by a split axle (or 'X') undercarriage. Production at the end of 1928 amounted to 403 machines of all variants and by February 1929 de Havillands were building 16 per week.

Licences were also granted to the General Aircraft Co. Ltd. in Australia, to the Finnish Government Aircraft Factory and to the Karhumäki Brothers, also in Finland. The first mentioned built a series of machines known locally as Genairco Moths, the ninth of which was Hermes powered and considerably modified. Genairco later developed the theme along its



D.H.60 Moth seaplanes *G-EBUJ* and *G-AADK*, c/n 450 and 921, of the Royal Singapore Flying Club, showing the locally installed Hermes I engines.



The Shuttleworth Trust's immaculate Hermes engined D.H.60X Moth landing at Old Warden in July 1975. (*Air Portraits*.)

own lines and produced a number of four seat variants officially referred to as Genairco Biplanes but irreverently known as Pregnant Moths. The 22 Moths built for the Finnish Air Force were at first fitted with Cirrus II engines but late production models were Hermes powered. Many survived in civil guise until the mid '50s, including at least one Karhumäki Moth which had an inverted engine and a coupé top to the rear cockpit. After twenty years in storage, one, the former *K-SILD*, was shipped to Australia in 1976 and rebuilt to flying condition as *VH-SSC*.

G-EBXG became important during 1928 as the trial installation machine used by Handley Page Ltd. for the development of automatic slots fitted to the majority of later Moths, Lady Heath flew *G-EBZC* to an altitude of 18,000 ft. over Croydon on October 4, 1928 and *G-EBWX* was used by Harold Balfour, M.P. for Thanet as a means of communication between Stag Lane and his constituency. Orders for the D.H.60X were received from many overseas purchasers of the Cirrus II Moth. They came first second in the 1929 Australian Aerial Derby and the Chilean Government took delivery of 24, one of which (c/n 657) was reserved for the use of Senor de Salanca, Director of Civil Aviation. The first aircraft registered in Southern Rhodesia was a D.H.60X and the second, *VP-YAB*, was used by the de Havilland agent J. H. Veasey to run a pioneer air mail service in the territory. Capt. de Havilland's original Cirrus II Moth *G-EBNO*, sold to Aero Material A.B. of Stockholm as *SE-ABS* in July 1928, was flown to Cape Town and back at the end of 1929 by the well known Swedish pilot Capt. Gosta Andree. Elsewhere in Africa *G-EBZL* was based at Kano, Nigeria by G. R. Boyd Carpenter and 'ZZ "Ashanti" lived on the Gold Coast to which it had been flown from Stag Lane by Capt. R. L. Rattray. Both returned home in 1930 to continue in private and club use with other examples of the type until 1939.

With the delivery of *G-AABL* to the London Aeroplane Club in September 1928, the D.H.60X went out of production in favour of more

advanced models but a few were constructed to special order later. These included two more seaplanes *G-AADJ* and *'DK* for the Singapore Club, *G-AAKJ* for the Anglo American Oil Co. Ltd., *G-AAYS* for the Hampshire Aeroplane Club, *G-ABAO* for the Brooklands School of Flying and a batch of 26 for flying clubs operated in Great Britain by National Flying Services Ltd. Eventually all four Singapore Club Moths were fitted with wheeled undercarriages and modified locally to take the Hermes I engine, which also powers the D.H.60X *G-EBWD*, preserved for all time by the Shuttleworth Trust at Old Warden, Beds.

SPECIFICATION AND DATA

Manufacturers: The de Havilland Aircraft Co. Ltd., Stag Lane Aerodrome, Edgware, Middlesex

General Aircraft Co. Ltd., Mascot Aerodrome, Sydney, N.S.W.

Valton Leutokonetehtas, Sveaborg, Helsinki, Finland

Veljekset Karhumäki O/Y, Keljo, near Jyväskylä, Finland

Power Plants: One 60 h.p. A.D.C. Cirrus I
One 75 h.p. Armstrong Siddeley Genet I
One 85 h.p. A.D.C. Cirrus II
One 90 h.p. A.D.C. Cirrus III
One 105 h.p. A.D.C. Cirrus Hermes I

Dimensions, Weights and Performances:

	Prototype	D.H.60 Moth	Cirrus II Moth		Genet Moth	D.H.60X
			Landplane	Seaplane		
Span . . .	29 ft. 0 in.	29 ft. 0 in.	30 ft. 0 in.	30 ft. 0 in.	30 ft. 0 in.	30 ft. 0 in.
Length . . .	23 ft. 6 in.	23 ft. 6 in.	23 ft. 8½ in.	24 ft. 10½ in.	24 ft. 3½ in.	24 ft. 8½ in.
Height . . .	8 ft. 7 in.	8 ft. 7 in.	8 ft. 9½ in.	10 ft. 1½ in.	8 ft. 9½ in.	8 ft. 9½ in.
Wing area . . .	225 sq. ft.	225 sq. ft.	243 sq. ft.	243 sq. ft.	243 sq. ft.	243 sq. ft.
Tare weight . . .	764 lb.	855 lb.*	890 lb.**	1,015 lb.	810 lb.	955 lb.
All-up weight . . .	1,240 lb.	1,350 lb.	1,550 lb.**	1,550 lb.	1,350 lb.	1,750 lb.
Maximum speed . . .	91 m.p.h.	91 m.p.h.	95 m.p.h.	92 m.p.h.	95 m.p.h.	98 m.p.h.
Cruising speed . . .	80 m.p.h.	80 m.p.h.	85 m.p.h.	75 m.p.h.	78 m.p.h.	85 m.p.h.
Initial climb . . .	430 ft./min.	430 ft./min.	650 ft./min.	500 ft./min.	360 ft./min.	570 ft./min.
Ceiling . . .	13,000 ft.	13,000 ft.	17,000 ft.	12,500 ft.	12,500 ft.	14,500 ft.
Range . . .	320 miles	320 miles	430 miles	390 miles	390 miles	290 miles

* 1926 Genet engined Lypne Trials aircraft 720 lb.

** Guggenheim machine, Tare weight 943.6 lb., All-up weight 1,435.1 lb.

Production:

Constructor's No. and Registration	C. of A. Issued	Remarks
(a) Prototypes		
168 <i>G-EBKT</i>	25. 6.25	Crashed at Stanmore, Middlesex 21.8.27
169 <i>G-EBKU</i>	23. 6.25	Crashed at Calcutta 22.7.27
(b) Pre-production		
183 <i>G-EBLI</i>	13. 8.25	London Aeroplane Club, crashed at Stanmore, Middlesex, 9.10.27
184 <i>G-EBLR</i>	13. 8.25	Lancashire Aero Club, crashed at Hale, Cheshire, 12.6.27
185 <i>G-EBLS</i>	13. 8.25	Yorkshire Aeroplane Club, written off 2.28

Constructor's No. and Registration	C. of A. Issued	Remarks
186 <i>G-EBLT</i>	13. 8.25	Midland Aero Club, withdrawn from use 11.36
187 <i>G-EBLU</i>	13. 8.25	London Aeroplane Club, crashed at Stag Lane 8.1.26
188 <i>G-EBLV</i>	13. 8.25	Lancashire Aero Club, airworthy at Hatfield in 1987
189 <i>G-EBLW</i>	9. 9.25	Midland Aero Club, crashed 11.29
190 <i>G-EBLX</i>	13. 9.25	Newcastle Aero Club, crashed at Blyth, Northumberland 20.5.31
191 <i>G-EBLY</i>	28. 9.25	Newcastle Aero Club, crashed at Cramlington 24.2.27
192 <i>G-AUAE</i>	15. 9.25	Controller of Civil Aviation, Australia, became <i>VH-UAE</i> in 1928, to the R.A.A.F. 1940 as <i>A7-88</i>
193 <i>G-EBME</i>	20.12.25	G. B. H. Mundy, to Air Taxis Ltd. 3.27, 1927 King's Cup winner, to Australia 9.27 as <i>G-AUME</i>
194 <i>G-EBMF</i>	31.10.25	W/Cdr. A. Wynn, scrapped at Gatwick 1948
196 —	20.12.25	Exported to Morrison and Co., Chile
197 <i>G-EBMO</i>	8. 7.26	1926 King's Cup winner, sold in India 6.27
198 <i>G-EBMP</i>	21. 1.26	London Aeroplane Club, to Sweden 11.29 as <i>SE-ACD</i> , broken up 1943
199 <i>A7-1</i>	31. 1.26	Royal Australian Air Force
200 <i>A7-2</i>	3. 2.26	Royal Australian Air Force
201 <i>G-EBMQ</i>	4. 2.26	Lancashire Aero Club, withdrawn from use 8.34

(c) Production Cirrus I Moths

Constructor's Numbers	Aircraft markings
233-235	<i>J8030, G-EBMU, 'MV</i>
241-249	<i>G-AUAJ, 'AK, 'AF, 'AG, 'AH, 'AL, J8031 (later G-EBVD), J8032, G-EBNM</i>
260-275	<i>G-EBNN, 'NO*, 'NX, 'NY, Irish Air Corps Nos. 23-26, G-EBOS, 'OH, 'OI, 'OU**, 'OT, U.S.A. demonstrator (later G-CAIL), Japan, G-AUFU</i>
280	<i>G-EBNP</i>
351-352	<i>G-AUFR, 'FL</i>

* Cirrus II engine.

** Genet engine.

(d) Production Cirrus II Moths

Constructor's Numbers	Aircraft markings
353-375	<i>G-EBPM, G-AUGH, G-EBPP, export, G-EBPQ, 'PR, 'PG, 'PS, 'PT, G-UAAA, G-AUFT, 'AM, 'AP, 'AR, 'AS, 'AT, 'AV, G-EBQE, 'QJ, U.S. Navy 7564 (later G-AADB), G-EBPU, G-W101 (to Deutsche Sportflieger), G-EBQV</i>
376-390	<i>G-EBQY, G-CAHK, G-EBQW, J8818**, J8816**, J8817**, J8821**, J8820**, J8819**, G-EBQX, 'QZ, 'RU, 'RX*, 'RY, Argentina</i>

* Later fitted with Cirrus Hermes I.

** Genet engine.

(e) Production D.H.60X Moths

Constructor's Numbers	Aircraft markings		
276	<i>G-EBQH</i> (trial installations)		
337-338	<i>G-EBYG</i> , 'YH		
400-425	<i>G-CAOU</i> -OY, <i>G-EBRH</i> , 'RI, <i>G-AUHF</i> , Australia (2), <i>G-CAHS</i> , <i>G-EBRT</i> , <i>G-AUGN</i> , 'HB, <i>G-EBRZ</i> , 'SA, 'SF, 'SI, 'SK, 'SN-SS, <i>G-AUGO</i> , 'GX		
426-450	<i>G-AUHA</i> , <i>G-EBST</i> , 'SU, 'TH, 'TD, 'TI, 'TJ, D-1238, <i>G-CAIG</i> , <i>G-UAAU</i> , <i>G-EBTV</i> , 'TZ, 'UA, <i>G-UAAE</i> , 'AF, <i>G-EBUF</i> *, <i>G-UAAE</i> , <i>G-EBUL</i> , 'US, airframe to Raab Katzenstein G.m.b.H., <i>G-EBUR</i> , <i>K-SALF</i> , <i>G-CAKA</i> , 'KB, <i>G-EBUJ</i> *		
451-475	<i>G-EBUK</i> *, 'UO, <i>G-AUGM</i> , <i>G-CAKC</i> , 'KD, <i>G-CYYY</i> , 'YW, <i>G-CAKE</i> , 'KF, R.C.A.F. Nos. 27 and 28, <i>G-CAKG</i> , 'KH, <i>G-AHUD</i> , 'HG, 'HJ, <i>G-EBVK</i> , <i>I-RUSP</i> , <i>G-EBTG</i> , <i>I-GINO</i> , <i>G-EBUU</i> , <i>G-CAKI</i> , 'KJ, <i>G-EBUV</i> , 'UW		
476-500	<i>G-EBUX</i> , C-PAAA, <i>G-EBUZ</i> , <i>G-UAAI</i> , S-AABM-BO, <i>G-EBVC</i> , <i>G-CATH</i> , <i>G-CYYS</i> , 'YR, 'YQ, 'YL, 'YK, 'YJ, 'YP, 'YO, 'YN, 'YM, 'YI, 'YH, M-CACC, M-CCAA, M-CCCA, G-NZAT		
501-525	<i>G-EBVJ</i> , <i>G-UAAL</i> , <i>G-CYYG</i> , <i>G-CAOY</i> -PC, <i>G-EBWZ</i> , J9103-J9118 (J9115 converted to D.H.60G and later <i>G-ADIL</i>)		
526-550	J9119-J9121 (J9119 later D.H.60G and <i>G-ACMB</i>), <i>G-EDCA</i> , <i>G-CYXI</i> , Argentina (3), Northern Rhodesia, <i>G-CAJW</i> , P-BABL, <i>G-EBVT</i> , 'VX, 'WA, 'VH-UAQ, Australia, 'VH-UAN, Australia (2), 'VH-UPU, Australia, NC5359, <i>G-EBXT</i> , Australia (2)		
551-599	Australia, <i>G-EBWD</i> *, 'WC (later <i>G-EBZN</i>), <i>G-CAJV</i> , 'NS, <i>G-EBWL</i> , 'WI, 'WS, <i>I-BUBI</i> , <i>G-CAJU</i> , Argentina, <i>G-CAKK</i> -KN, <i>G-EBWV</i> *, <i>G-CAKO</i> -LD, <i>G-EBWX</i> , 'WY, <i>I-BIBL</i> , Argentina, <i>G-UAAZ</i> , 'AN, <i>I-SIDE</i> , <i>G-EBWT</i> , <i>G-NZAU</i> , <i>G-EBXB</i> , 'XS, 'XW, <i>G-CANA</i> , Australia, 'VH-UQC, 'PX, 'PK		
600-625	Australia (4), <i>G-AUGS</i> -GU, <i>G-UAAW</i> , VP-YAA, <i>G-EBXF</i> , <i>G-CARV</i> , 'RW, <i>G-CATK</i> , 'VH-UAO, 'AU, <i>G-EBXG</i> , NC7106, <i>G-CATG</i> , 'TI, 'JY, 'JZ, 'TZ, 'TJ, 'TF, M-CDDA, <i>G-UAAP</i>		
626-650	<i>G-EBXP</i> , 'XU, <i>G-CAUC</i> , 'UN, 'UA, 'UB, 'VI, 'RZ, 'UO, 'RX, 'RY, 'UE, 'UQ, 'UD, 'RU, R.C.A.F. 55, <i>G-CAUP</i> , <i>G-EBZE</i> , 'ZF, R.C.A.F. 56-57, <i>G-EBYJ</i> , 'YV, 'ZX, 'ZI		
651-675	Chilean Govt. G.I-G.21, <i>G-EBYD</i> , Chilean Govt. G.22-G.24		
676-702	<i>G-EBZG</i> , C. Cooper, <i>G-EBZC</i> , 'ZH, R.C.A.F. 58, <i>G-EBZP</i> , 'ZL, 'ZO, 'ZS-ZU, 'ZW, <i>G-CAVF</i> -VH, <i>G-EBZZ</i> , <i>I-ABEB</i> , 'EC, <i>G-AAAC</i> , 'AD, <i>G-CAUM</i> , <i>G-AAAG</i> , <i>G-UABD</i> , <i>G-ABAH</i> , 'BA, <i>G-UABC</i> , <i>G-AABL</i>		
920-921	<i>G-AADJ</i> *, 'DK*	1266	<i>G-ABBD</i>
1162	<i>G-AAKJ</i>	1279-1281	<i>G-AAMP</i> , 'MR, 'MO
1164-1173	<i>G-AAPA</i> -PJ	1285	<i>G-AAMS</i>
1198-1201	<i>G-AAPL</i> -PO	1809	<i>G-AAMT</i>
1215-1216	<i>G-AAPV</i> , 'PW	1826	<i>G-AAMU</i>
1228-1229	<i>G-AAMM</i> , 'MN	1828	<i>G-AAMV</i>
1232	<i>G-AAYS</i>	1831	<i>G-AAMW</i>
1247	<i>G-ABAO</i>		

* Later fitted with Cirrus Hermes I engine.

** Completed as long range D.H.60G Gipsy Moth.

(f) Built by General Aircraft Co. Ltd., Sydney, N.S.W.

Nine aircraft including c/n 1, 2, 3, 6, 7, 8, 9—*VH-UFV*, 'GE, 'GJ, 'GL, *G-AULH*, *VH-UMS*, 'MK

(g) Built from Stag Lane components by QANTAS at Longreach

Three aircraft 1926-1927: *G-AUFI*, 'FJ and 'FK. The 1st and 2nd for the West Australian Airways flying school at Perth; *G-AUFJ* for the QANTAS flying school at Longreach.

(h) Built by the Finnish Government Aircraft Factory, Helsinki

Ten aircraft in 1929: (c/n 1-10) Finnish Air Force *MO-91* to *MO-100*; twelve in 1930 (11-22) *MO-101* to *MO-112*. Moths *MO-98* to *MO-100* (c/n 8-10) later sold for civil use as *K-SILD*, *OH-ILB* and *OH-ILC*.

(i) Built by Veljekset Karhumäki, Keljo

Two aircraft: (c/n 1-2) *OH-VKD*, *OH-VKE*.



VH-UMK, the ninth and last Moth built in Australia by the General Aircraft Co. Ltd. It differed from the D.H.60 in fuselage lines and rudder shape, and the engine was a Cirrus Hermes I.



A D.H.60 Moth seaplane with Cirrus II engine, built by Valton Leutokonetehtas at Helsinki, Finland in 1929.



A D.H.60G Gipsy Moth single seater, c/n 919, in Spanish colours as *EC-AQQ*. Built in October 1928 it was originally delivered to the Swiss Aero Club as *CH-208*.

De Havilland D.H.60G Gipsy Moth

By 1926 Moth output was approximately one a day and the demand for Cirrus engines was rapidly exhausting the once large stocks of war surplus Renault components. The de Havilland Company therefore asked Maj. F. B. Halford to design an entirely new replacement engine. Drawings were started on October 29, 1926 and the first experimental examples of the now almost legendary Gipsy engine, rated at 135 h.p. for a weight of about 300 lb., were completed by D.H. engineers Weedon and Mitchell in July 1927. Such a power/weight ratio invited attempts on speed records and the little D.H.71 Tiger Moths, designed for the purpose, were the smallest aeroplanes that could be built around Hubert Broad and one Gipsy engine. The chapter on these aircraft records the Gipsy's success, and an engine shop for its production was then built and equipped at Stag Lane in 16 weeks. Production engines, derated for installation in the Moth, gave 85 h.p. at 1,900 r.p.m. or 100 h.p. at 2,100 r.p.m., and the first, delivered on June 20, 1928 and designated Gipsy I, was installed in the company's trial installation Moth *G-EBQH*. Although still technically a D.H.60X Moth (or if fitted with Handley Page automatic wing tip slots, the D.H.60X autoslot), and issued with its C. of A. as such, the Gipsy engined variety was always known as the D.H.60G Gipsy Moth. The delightful control characteristics of earlier Moths were retained but the higher wing loading and the steerable tail skid made the Gipsy Moth considerably easier to handle on the ground.

To publicise the new model, three of the 14 Moths competing in the 1928 King's Cup Race, *G-EBQH*, 'YK and 'YZ flown by A. S. Butler,

H. S. Broad and W. L. Hope were Gipsy powered, Hope handsomely winning his second King's Cup at an average speed of 105 m.p.h. Although many earlier models were subsequently fitted with Gipsy engines, Hope's 'YZ with constructor's number 801 was the first production Gipsy Moth in spite of its straight axle racing undercarriage. This early success was followed by a skilfully arranged proving and publicity programme. On July 25, 1928 Capt. Geoffrey de Havilland reached a record altitude of 19,980 ft. in his private Gipsy Moth *G-AAAA* and during August 16–17th H. S. Broad remained aloft over Stag Lane for 24 hours in *G-EBWV* equipped with extra fuel tanks in the front cockpit and behind the pilot's seat. The petrol load on take off was equal to the weight of four grown men—a performance on one Gipsy which no doubt inspired the Fox Moth design four years later. A. S. Butler, chairman of the company, continued the proving process on December 7th by breaking the 100 km. closed circuit record from Stag Lane to Twyford and back in *G-AAAL* at 119.84 m.p.h., but the Gipsy's final ordeal drew attention to its quite extraordinary reliability and permitted a dramatic increase in the between-overhauls life of the engine. *G-EBTD*, one of the company's earlier Moths, was fitted with a Gipsy I taken at random from the production line and



The well known D.H.60 Moth *G-EBTD*, c/n 430, flying in the 600 hour sealed Gipsy engine reliability test in 1929.

sealed by the A.I.D., after which D.H. Reserve School instructors including Geoffrey de Havilland Jnr., flew it for 600 hours between December 29, 1928 and September 24, 1929. A distance of 51,000 miles was covered, during which the Gipsy received only routine attention and at the end of the test the cost of replacement parts was a mere £7 2s. 11d.

These events made considerable impact on the aviation world so that the Gipsy Moth became overnight the best known of all contemporary



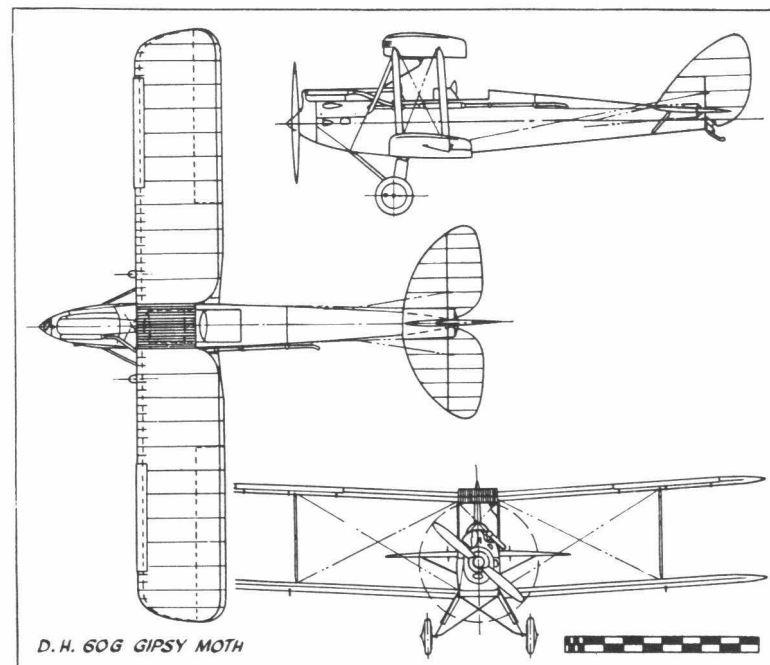
The single seat racing Moth *G-AAHR*, c/n 1068, with enclosed cockpit used by Hubert Broad for competition flying at home and abroad in 1929–30. ('Flight' Photo 7780.)

aeroplanes. Its career followed the familiar pattern of its predecessors, and was one of cheap, reliable and often unspectacular service with flying clubs, private owners and taxi firms in all parts of the world. Large numbers were shipped out to the Australian company and six, *VT-AAA*, 'AB', 'AE'–'AH', were sent to India for a chain of flying clubs operated by the Aero Club of India and Burma Ltd. founded by Sir Victor Sassoon in 1928. In the following year the de Havilland Aircraft Co. of India Ltd. was formed to assemble the innumerable Gipsy Moths ordered for club and private use in Asia, and Maj. A. M. Miller formed Union Airways Ltd. with five Gipsy Moths *ZS-ABH*–'BL', shipped out in July 1929 to establish the first regular commercial air service in South Africa. The inaugural service left Cape Town for Port Elizabeth with five bags of mail on August 26th and the small fleet operated with almost 100% regularity to Johannesburg and Durban until 1933.

At £650 ex works the popularity of the Gipsy Moth was such that Stag Lane reached an output of almost three a day by the end of 1929 and licences were granted to Morane-Saulnier and the Moth Aircraft Corporation for additional construction programmes in France and the U.S.A. Seventeen British built Gipsy Moths were also shipped to the Moth Aircraft Corporation (a subsidiary of the Wright organisation which built Gipsy engines), and some of these aircraft were disposed of in Canada. One was flown by Thea Rasche in the 1929 National Air Races, coming first in the Women's Pursuit Handicap and fourth in the Women's Air Derby. Another was third in the 1930 Women's Dixie Derby from Washington, D.C. to Chicago in 16 hours 47 minutes piloted by Laura Ingalls, who later set up a record of 344 continuous loops in the same Gipsy Moth at St. Louis, Montana.

The Moth was supreme among light aeroplanes and an enclosed version,

G-AAHR, with low built racing coupé top won the Zenith Cup in France on September 16, 1929 piloted by H. S. Broad who was also first in his class in the 1929 and 1930 Challenge Internationale de Tourisme. The type took first places in the Canadian National Air Races, made fastest time and filled five out of the first six places in the Australian East–West Air Race, won the South African Aerial Derby, all the major awards at the Rotterdam International Flying Meeting, and made fastest time in the 1929 King's Cup Race, a performance repeated in 1930 by A. S. Butler. It was used in nearly every civilised country in the world. It was the standard military trainer of the New Zealand Ministry of Defence, the Chilean Air Force, the Danish Flying Corps and Naval Air Service, the Rumanian Air Force, and the governments of China, India, Sarawak and Portugal. For the training of civil pilots the Gipsy Moth was used by flying clubs and schools in London, Bristol, Birmingham, Nottingham, Norwich, Southampton, Lympne, Newcastle, Northampton, Leicester and Glasgow; in Australia at Sydney, Melbourne, Adelaide, Perth, Brisbane and Longreach; in Canada at Halifax, Granby, Montreal, Ottawa, Toronto, Hamilton, London, Winnipeg, Regina, Moose Jaw, Saskatoon, Calgary, Edmonton and Victoria; in South Africa at Johannesburg, Cape Town, Durban, East London and Port Elizabeth; and by flying clubs in Kenya, Sweden, Singapore, Switzerland, Spain, Finland and Colombia. Moths were flown commercially in





John Grierson in his Gipsy Moth seaplane *G-AAJP*, "Rouge et Noir", c/n 1123, at Brough on July 27, 1933 before the start of his flight to Iceland. The strutting of the Blackburn float undercarriage differed considerably from that of the standard Short variety. (Topical Press Photo.)

Argentina, Austria, Brazil, U.S.A., Germany, the Dutch East Indies, Poland, Portugal, the Straits Settlements, Nigeria, Tanganyika, the Bahamas, Southern Rhodesia, New Guinea, China, Mexico, Mozambique, Norway, Belgium, France, Peru and Yugoslavia. Lord Wakefield, who had done so much for civil flying, presented Gipsy Moths to flying clubs in India, New Zealand and South Africa.

In a golden age of private flying it commenced a distinguished career in long distance flying when the fourth production machine *G-AAAH* was completed as a long range single seater for a rapid flight to Kisumu and back by W. L. Hope of Air Taxis Ltd. in September 1928. In the same month the Vicomte de Sibour and his wife left Stag Lane in *G-EBZR* "Safari II" for a world tour, successfully completed via the Far East and a flight across the U.S.A. in the following year. The long range Gipsy Moth in which H. S. Broad had flown for 24 hours was also tuned up and shipped to Newfoundland for an attempted Atlantic flight by Lt. Cdr. H. C. MacDonald D.S.C. who took off for England with petrol for 25 hours on October 17, 1928. Although seen by a ship when 600 miles out, he was never heard of again. Prince Jean Ghica of Rumania used a single seat Gipsy Moth *CV-TUR* for an attempted long distance record but sensibly flew overland and left Bicester for Istanbul on July 9, 1930. He almost succeeded but crashed at Teteven in Central Bulgaria the next morning.

The Gipsy Moth will forever be associated however with the Australia route, blazoned by Amy Johnson in "Jason", the former Air Taxis long

range machine. Her now famous flight to Australia commenced at Croydon on May 5, 1930 and ended at Darwin on May 24th and although three days outside Hinkler's record, was the first England-Australia solo flight by a woman. Francis Chichester, the first male to complete the journey in a Moth, arrived at Darwin on January 25, 1930 in *G-AAKK* "Madam Elijah" five weeks after leaving Croydon. The aircraft was then shipped to New Zealand and a year later fitted with floats borrowed from a N.Z.A.F. Moth in readiness for his all time epic of navigation in locating and landing at the microscopic Norfolk and Lord Howe Islands during his flight back to Australia. This historic Gipsy Moth was later wrecked taking off in a restricted waterway at Katsuura, Japan on August 14, 1931 during an attempt to fly home via the Aleutians and Canada. A similar machine *G-ABEN* made a leisurely outward flight between October and December 1930 flown by F/Lt. C. W. Hill and returned as *VH-UPV* in April-June 1933 piloted by the Australian Mrs. H. Bonney. The only Gipsy Moth actually to break the Australia record was *VH-UFT* flown from Wyndham to Pevensey Beach by J. A. Mollison in 8 days 19 hours 25 minutes in July 1931. Four years previously, as described on page 220, this had been *G-AUFT*, the first Cirrus Moth erected in Australia but had been rebuilt as a single seater with Gipsy engine for the record attempt. In the following year it went into service with Cobham's National Aviation Day Displays as *G-ABUB*. The wooden Gipsy Moth was also constructed in limited numbers in Australia by de Havilland Aircraft Pty. Ltd. and the Larkin Aircraft Supply Co. Ltd.

The Gipsy Moth penetrated to the remotest parts of the earth. John Grierson flew *G-AAJP* "Rouge et Noir" to Lahore in 1930, to Baghdad



The coupé Moth *G-AAIM*, "Arom II", c/n 1153, with Cirrus Hermes I engine, used by Shell Mex and B.P. Ltd. in 1929.



John Scott Taggart's Gipsy Moth *G-AADV*, c/n 998, with Short amphibian undercarriage.
(Short Photo.)

in 1931, to Moscow in 1932 and on floats from Brough to Iceland in 1933. *G-EBZY* belonging to N. S. Chalmers was the first light aircraft in Fiji, where it was based on a cricket pitch. An R.A.A.F. Gipsy Moth seaplane *A7-55* piloted by F/Lt. E. Douglas and operating with R.R.S. *Discovery II* in the Bay of Whales, located the missing Antarctic explorer Lincoln Ellsworth on January 15, 1936. Large numbers of float equipped machines were sold overseas for commercial, training or patrol duties and one, *G-AALJ*, was taken to the Bahamas by Maj. A. A. Nathan who had previously owned a D.H.60X seaplane *G-EBYV*. The short lived Caribbean Airways of Kingston, Jamaica had an unregistered Gipsy Moth seaplane, c/n 1283, in those waters at the same time.

The chief variant of the Gipsy Moth was the coupé model, the first of which was Capt. de Havilland's personal *G-AAAA* fitted experimentally with a light wood and fabric superstructure equipped with celluloid windows. Later in 1928 seven other coupé Moths with Triplex glazing, *G-AACL*, 'DX', 'EE', 'GT', 'HI', 'HS' and 'LK' were delivered to A. S. Butler, A. C. M. Jackaman, Lady Bailey, Bentley Motors Ltd., Nigel Norman, de Havilland's sales department and the Rt. Hon. F. E. Guest respectively. In spite of improved performance and comfort it was not a popular innovation because payload was reduced by 25 lb. and all subsequently reverted to standard. A special coupé Moth *G-AAIM* with Cirrus Hermes I was acquired by the Aviation Dept. of Shell Mex and B.P. Ltd. in 1929 and two enclosed models, *G-AAUR* and 'ZR' were supplied to the British Arctic Air Route Expedition which used them on floats and skis to survey the Greenland coast in 1930. A coupé Moth seaplane exhibited at the Olympia Aero Show in July 1929 was purchased by a Norwegian whaling company and ferried on wheels by pilot Lief

Lier from Stag Lane to Oslo for embarkation on the factory ship *Kosmos*. It was the first attempt to use an aeroplane for whale spotting but the aircraft, *N-40*, was lost on a flight over the Antarctic on December 27, 1929. Several other coupé Moths were sold overseas however, including *ZS-ABK* and 'BL' to Union Airways in South Africa and one to the Duke of Estremena which left Stag Lane with the Spanish ferrying marks *MW-117* in May 1929. It was accompanied by *MW-113* to *116*, four special Gipsy Moths ordered by the Compania Espanola de Trabajos Fotogrametricos S.A. for aerial survey work in Spain. They were flown from the front seat because the rear cockpit had been enlarged to permit the free use of vertical and oblique cameras.

The only other variants of note were the two aircraft fitted to special order with the Short amphibian undercarriage developed for that firm's second Mussel prototype, consisting of two wing tip stabilising floats and one large central float through which passed a steel shaft carrying retractable wheels. The first Moth amphibian, *G-AADV*, was delivered to John Scott Taggart in February 1929 and flew a good deal at Rochester and on the Solent at the time of the Schneider Trophy contest, when it was moored alongside the steam yacht *Conqueror*. The other, *G-AAVC*, fitted with a Cirrus Hermes I, was delivered to the Hon. A. E. Guinness in May of the following year for use in Ireland.

In later years some aircraft were fitted with the improved 120 h.p. Gipsy II or in a single case, the Norfolk and Norwich Club's *G-AABK*, with a 120 h.p. Gipsy III inverted engine. Early in 1935 a D.H.60G was used to air test the prototype General Aircraft V.4 inverted four cylinder 4 litre aircooled engine of 85 h.p.

The wooden Gipsy Moth continued in production until 1934 in which year the de Havilland Technical School built two, *G-ABTS* and *G-ACAM*, as an exercise, bringing the total number of British-built Gipsy Moths to 595. The last production aircraft, *HB-OFI* with constructor's number 1927, went to a Swiss purchaser but returned to England in May 1939 for instructional use by Malling Aviation Ltd. as *G-AFTG*. During the war it was one of hundreds impressed for military communication duties or as instructional airframes throughout the Commonwealth. Its sister machine, *HB-OBA*, which survived to be flown home from Switzerland as *G-ATBL* by Edward Eves in 1965, was later refurbished by C. C. Lovell at Netheravon and, after sale to A. Haig-Thomas, was kept for a time in the Southend Historic Aircraft Museum. *G-ABJJ*, which did considerable postwar flying at Fairoaks, was sold in Canada in 1962 as *CF-AAA* and in 1972 the Australian *VH-UFN* went to Glendale, California to fly as *N168G*. Both were airworthy in 1987, with the latter, still retaining its American registration, based in the Netherlands.

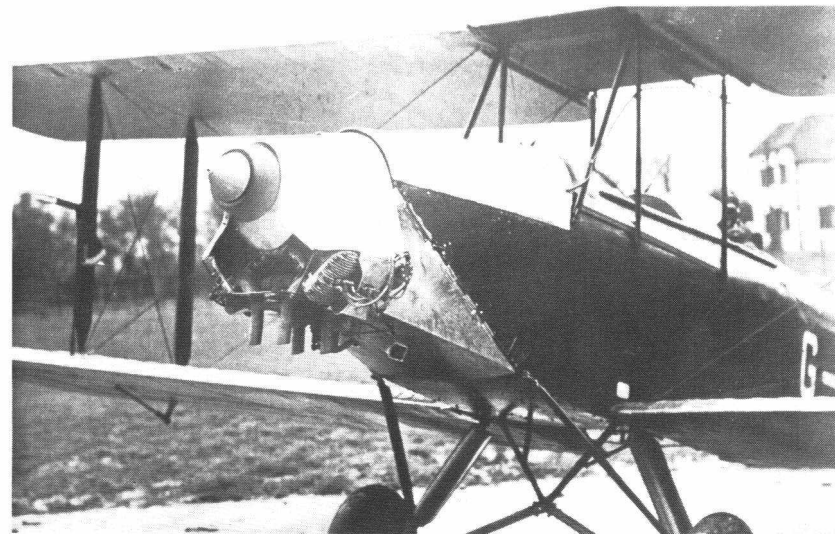
The 1980s saw a renewed interest in Moths inspired, perhaps by the highly successful De Havilland Moth Club, with several being rebuilt to pristine condition. In 1987 airworthy Gipsy Moths included J. F. W. Reid's *G-AAWO* at Hook; The Shuttleworth Collection's *G-ABAG*

(rebuilt at Blackbushe in 1974, 19 years after it crashed at Perth); the onetime *HB-OKI* allocated the period registration *G-ABEV* in 1977 and based at Chalmington; the thirteenth Morane Saulnier Moth allocated *G-AANV* in 1984 and rebuilt by The Aeroplane Company (Hamble) Ltd.; and the former *EC-AAO*, delivered to Spain as *MW-118* in 1929 and rebuilt over five years by J. A. Potheary at Shoreham. Registered *G-AAOR*, it was finished in Spanish Civil War livery and marked *EM-01*. Another machine *G-ABDX*, formerly *HB-UAS*, was undergoing rebuild at Hamble and others were being restored in Australia and New Zealand.

Amy Johnson's immortal *G-AAAH* was on permanent display at the Science Museum, London, and others were to be seen in museums in Australia.



Two Gipsy Moths still flying in 1987 were M. E. Vaisey's ex-Swiss *G-ATBL* (*Air Portraits*) and The Shuttleworth Collection's *G-ABAG* (seen taking off in the South Coast Air Race at Shoreham on September 22, 1951). (*A. J. Jackson*)



The Gipsy Moth testbed for the prototype 85 h.p. General Aircraft V.4 inverted, four cylinder, aircooled engine.

SPECIFICATION AND DATA

Manufacturers: The de Havilland Aircraft Co., Stag Lane Aerodrome, Edgware, Middlesex
De Havilland Aircraft Pty. Ltd., Bankstown Aerodrome, Sydney, N.S.W.
The Larkin Aircraft Supply Co. Ltd., Melbourne, V.
Aeroplanes Morane-Saulnier, Villacoublay, France
The Moth Aircraft Corporation, Lowell, Massachusetts, U.S.A.

Power Plants: One 100 h.p. de Havilland Gipsy I
One 105 h.p. Cirrus Hermes I
One 120 h.p. de Havilland Gipsy II
One 120 h.p. de Havilland Gipsy III
One 85 h.p. General Aircraft V.4

Dimensions, Weights and Performances:

	Landplane	Seaplane	Amphibian
Span . . .	30 ft. 0 in.	30 ft. 0 in.	30 ft. 0 in.
Length . . .	23 ft. 11 in.	24 ft. 10½ in.	—
Height . . .	8 ft. 9½ in.	10 ft. 1½ in.	—
Wing area . . .	243 sq. ft.	243 sq. ft.	243 sq. ft.
Tare weight . . .	920 lb.*	1,015 lb.	1,249 lb.
All-up weight . . .	1,650 lb.**	1,650 lb.	1,644 lb.
Maximum speed . . .	102 m.p.h.	98 m.p.h.	—
Cruising speed . . .	85 m.p.h.	80 m.p.h.	—
Initial climb . . .	500 ft./min.	480 ft./min.	550 ft./min.
Ceiling . . .	14,500 ft.	13,000 ft.	—
Range . . .	320 miles	300 miles	—

* Individual aircraft varied + or - 30 lb.

** 1,750 lb. with Gipsy II engine.

(a) At Stag Lane

Constructor's Numbers	Aircraft markings
801-825	<i>G-EBYZ, G-AABN, 'AJ, 'AH, 'AA, G-EBZY, G-AAAK, 'AO, 'AL, 'AS, 'BK, Argentina, G-CAVK, G-AAAM, 'AV, 'BM, 'AI, Argentina, G-AUID, 'IE, 'IF, 'IG, 'IH, 'IJ, G-EBYK</i>
826-850	<i>G-AAAE, 'BJ, Chile, G-EBYS, South Africa, G-AACK, CH-205, G-AUGV, 'GW, 'IA, 'JU, 'JW, 'JX, G-AASN, Sarawak, G-AACY, G-UABA, G-CALE, G-EBZR, G-AABI, G-AUJV, 'LA, 'IB, 'IC, VT-AA</i>
851-875	<i>VT-AAB-'AH, G-CAVJ, 'VW, 'UR, CF-CAK, G-CAVU, CF-ADS, Argentina, G-AABO, G-NZAW-'AZ, N.Z.A.F. 870-873, G-AACO, G-AUHN</i>
876-900	<i>G-AUHO-'HS, Canada, CF-AAD, Export, CF-AAC, NC9720, NC9718, G-AACL, ZK-AAA, G-AADH, T-DMOT, G-AUIO-'IS, VH-UMV, G-AUKG, 'LC, Danish Naval Air Service No. 148 and 149</i>
901-919	<i>Danish Army Flying Corps S.100-S.105, VT-AAI, 'AJ, G-CAPH, CF-AQF, U.S.A. (2), NC9733, G-NZEA, 'EB, G-AAEU, 'DC, O-BAJW, CH-208</i>
922-929	<i>ZK-AAO, X-BACQ, NC9749, NC9970, NC9971, G-NZEC, 'ED, 'EF</i>
930-969	<i>Chilean Govt. G.25-G.64</i>
970-1000	<i>G-AADI, X-BADR, G-AUKN, 'KL, 'KF, 'KJ, G-AULQ, 'LR, NC491E, NC490E, NC492E, G-AAEE, G-AUJH, 'JI, 'JK-'JN, G-AADW, 'FO, 'EN, 'CM, K-SATA, G-AAEI, 'EL, N.Z.A.F. 995 under A.M. Contract 859087/28, VT-AAR, G-AAEX, 'DV, 'FY, EI-AAC</i>
1001-1026	<i>C-PMAA, G-AADX, 'EB, VP-KAC, G-AAFL, 'FM, 'GZ, 'GD, 'GM, 'GI, 'HS, 'FS, MW-113 to MW-116, G-AADD, Germany (Dr. P. von Bauer), G-AADA, Argentina, G-AACZ, 'DP, Shanghai (4)</i>
1027-1050	<i>G-AAEG, 'DS, Spain, G-AAEA, D-1644, CH-235, Shanghai (4), G-AAFC, Shanghai (2), G-AAFK, VH-UKY, G-AAGS, 'EW, NC493E, G-AAKO, PK-SAD, G-AALN, 'SY, 'JN, 'JR</i>
1051-1075	<i>G-AAHF, 'GT, 'SB, 'JL, 'IU, 'HO, Argentina, G-AAGA, 'EF, G-AULT, G-UAAE, G-AAHX, NC605E, NC606E, G-AUKU, 'KV, G-AAHP, 'HR, G-AUKO, 'KM, VH-UAW, G-AULE, 'KX, 'LJ, MW-118</i>
1076-1100	<i>M-CHAA, SP-TUR, I-AANC, G-AAEO, 'ET, 'IW, 'HI, 'EH, 'JT, 'HG, MW-121, G-AALJ, VH-UMA, G-AAHT, 'IA, 'JM, 'KU, 'KK, 'IE, 'FI, 'EP, 'ER, MW-117, G-AAHU, 'IC</i>
1101-1125	<i>G-AAJO, ZK-AAR, G-AAJU, 'IV, 'JJ, 'JA, ZS-ABH, G-AAJV, SP-ADX, G-AAIB, ZK-AAS, Shanghai (10), VT-AAU, G-AAJP, ZS-ABI, 'BJ</i>
1126-1150	<i>G-AAKG, 'KF, G-AULD, G-AAKL, 'JG, ZK-AAU, 'AT, MW-122, G-AAJZ, 'JW, 'KN, LD, VT-AAX, G-AAJS, 'LE, Shanghai, G-AAKM, ZS-ABK, Shanghai, ZS-ABL, Shanghai, ZS-ABM, D-1724, G-AAKC, 'KD</i>
1151-1161	<i>G-AAKE, 'KI, 'IM, 'KX, VT-ABB, Shanghai (3), G-AALR, 'LM, VT-AAZ</i>
1163	<i>Germany</i>
1174-1197	<i>G-AALK, 'LY, 'RE, 'LZ, 'LU, 'LV, 'LW, Yugoslavia (3), G-AALT, ZK-AAV, G-AARA, 'RC, F-AJMC, Yugoslavia, ZS-ABP, Portuguese Air Force (4), C-PMAB, VT-ABC, ZK-AAW</i>
1202-1214	<i>ZK-AAX, G-AASG, Shanghai (3), ZK-AAZ, VP-YAJ, G-AARW, Shanghai (2), CV-HAR, 'HOR, 'HAZ</i>
1217-1227	<i>ZK-ABB, MW-128, Shanghai (2), ZK-AAF, A-78, MW-129, MW-130, Argentina, VT-ABE, 'BF</i>
1230-1231	<i>G-AAVY, 'WL</i>
1233-1246	<i>G-AAYT, 'WN-'WR, 'VC, 'WS, F-AJNZ, G-AAWX, Shanghai (2), G-ABJT, G-AAUR, 'ZE</i>

Constructor's Numbers	Aircraft markings
1248-1265	<i>G-AAYJ, ZK-ABH, 'BP, G-AAYY, 'YL, 'ZG, 'ZL, 'ZZ, G-ABAD-'AH, 'BA, 'BG, 'AM, 'AL, 'AK</i>
1267-1278	<i>G-ABBI, 'BJ, CV-TUR, G-ABBK, 'BM, 'BO, 'BP, VH-UPF, G-AAZR, G-ABBV-'BX</i>
1282-1284	<i>G-ABCS, Caribbean Airways seaplane, G-ABDA</i>
1286-1299	<i>G-ABCT, 'DR, 'CG, 'EK, 'DU, 'DV, 'EP, MW-134, G-ABDX, airframe to D. H. Servicing Dept., G-ABER, CH-216, G-ABEB, 'ES</i>
1800-1808	<i>G-ABFD, VT-ACG, G-ABGC, South Africa, G-ABDK, CV-TUR (replacement for c/n 1269), ZK-ABQ, G-ABGY, 'GL</i>
1810-1825	<i>OO-ADG, G-ABGM, 'EN, 'EO, 'GN, South Africa, G-ABGP, 'FT, SP-AEU, G-ABGV, 'FW, India, G-ABGV, CH-217, G-ABHS, 'JC</i>
1827	<i>G-ABDE</i>
1829-1830	<i>CS-AAC, G-ABHM</i>
1832-1850	<i>Argentina, airframe to Airwork Ltd, OO-ANG, CH-277, VT-ACL, G-ABJL, 'JH-'JJ, 'JE, 'JZ, CH-220, ZS-ACO, G-ABND, 'IO, OO-ARG, G-ABLN, ZS-ADB, G-ABLN</i>
1851-1875	<i>G-ABJN, 'LT, 'LZ, 'MA, CH-279, G-ABOE, 'OG, Malaya, G-ABOA, 'OW, South Africa, G-ABOU, 'OY, CH-320, G-ABON, 'OZ, 'PC, 'OV, 'PD, 'RO, 'PK, CH-321, CH-322, G-ABPT, OO-AMM</i>
1876-1900	<i>OO-AML, G-ABRD, CH-325, G-ABPP, CH-324, F-ALRR, CV-ASP, G-ABSD, 'RT, 'SH, VT-ADC, OO-AMR, ZS-ACW, CH-329, CH-341, G-ABTP, CH-330, G-ABTW, 'VA, ZS-ACY, G-ABWL, 'WN, 'WM, 'WY, 'TS*</i>
1901-1927	<i>G-ABXT, 'XB, 'XC, 'XZ, 'XR, 'YA, 'YI, 'ZE, ZK-ADA, 'DB, VP-KAS, CH-350, VP-KAX, SU-ABF, G-ACAM*, EC-TTA, CH-353, EC-UAU, CH-357, HB-UKI, G-ACJG, VT-AFE, 'FG, G-AFDZ, ZK-AGU, 'GV, HB-OFI</i>

* Built by the de Havilland Technical School.

(b) Built by Morane-Saulnier

Constructor's Numbers	Aircraft markings
1-25	<i>F-AJOE, 'OC, 'QD, 'QC, 'RT, export, F-AJRL, 'QG, 'OQ, 'QH, 'OD, 'RP, 'NY, 'OF-'OI, 'RS, 'OJ, 'OK, 'OL, 'RO, 'OM, 'RN, 'QI</i>
26-48	<i>Export, F-AJON, 'OO, 'RF, 'OP, 'RM, 'UJ, 'UE, 'UF, 'VN, 'F-ALIE, 'KX, 'F-AJVP, F-ALML, 'CB, 'OJ, 'OK, 'OO, 'PB, 'OZ, 'UV, 'VA, 'VB</i>

(c) Built by the Moth Aircraft Corporation

Constructor's Numbers	Aircraft markings
1A-1R	<i>NC9797, NC809E-NC811E, NC830E, NC831E, export, NC318H-NC320H, NC372H, NC373H, export, NC825H-NC829H</i>

(d) Built by the Larkin Aircraft Supply Co. Ltd.

Thirty-two aircraft built for the Australian Government in 1929 and delivered to the R.A.A.F. as A7-23 to A7-54 inclusive



VH-UNI, identified as a D.H.60M Moth by its prominent fuselage stringers, was exported to Australia with C. of A. dated November 20, 1929. (C. C. Wright Photo.)

De Havilland D.H.60M Moth

To meet overseas requirements a strengthened version of the Gipsy Moth, with welded steel tube fuselage, wide cockpit doors and large locker, was introduced in 1928 and designated D.H.60M. Earlier Moths had, of course, done sterling work in remote areas of the earth but wooden fuselages were easily damaged and not so easily repaired. The metal fuselage imposed a weight penalty of some 62 lb. but a doped fabric patch was sufficient to cover holes and the interior was more readily accessible for inspection and maintenance. Unlike its flat sided, wooden forebear, the new fuselage boasted a number of prominent longitudinal stringers which were a useful means of distinguishing the D.H.60M, loosely referred to as the Metal Moth, from the Gipsy Moth.

The first D.H.60M, *G-AAAR*, was sent to Canada at the end of 1928, where as *G-CAVX*, it was evaluated on wheels, skis and floats by the Royal Canadian Air Force. The second 'off', *G-AACD*, became the manufacturer's test aircraft, the third was sent to the Moth Aircraft Corporation in the U.S.A. and the fourth, *G-AACU*, became the first of several added to the strength of the de Havilland School of Flying at Stag Lane. An initial production order for 50, placed by the R.C.A.F. in 1929, quickly followed rigorous trials during which the prototype was flown over London, Ontario in an air temperature of -7 degrees F. Ninety more were despatched to de Havilland Aircraft of Canada Ltd. to meet orders placed by the Ontario Provincial Air Service, and clubs and flying schools all over North America. Many were equipped with low pressure 'doughnut' tyres, a fashion which soon ousted the old spoked wheels. Others were fitted with large, semicircular, sliding coupé tops to become forerunners of the totally enclosed Canadian-built Tiger Moths of two decades later, while floats and skis were obligatory in many areas. They carried the first air mail to Newfoundland, and one, *CF-ADC*, was shipped back to

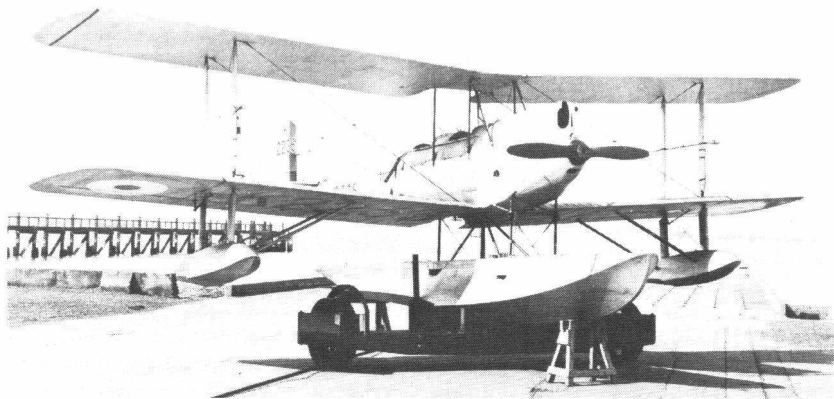
England by J. R. Hibert who between October 12 and December 6, 1932 flew it from Heston to Darwin, but later crashed at Cloncurry where he sold it locally as *VH-UQV*.

Arnhold and Co. of Shanghai sold a very considerable number of metal fuselaged Moths to the Chinese Air Force for which they were test flown by Capt. Swoffer. One was shipped to the S.A.A.F., two to the Danish Army Air Corps and eight to the R.A.A.F., a repeat order for which was executed entirely in the Sydney factory of de Havilland Pty. Ltd. Ten were also built under licence by the Norwegian Army Aircraft Factory in 1931.

To illustrate the load carrying capability of the D.H.60M there is no better example than the fleet of five which landed at Baghdad on April 22, 1931 after being flown from Hatfield by Royal Iraqi Air Force pilots. First aircraft to bear Iraqi military markings, each carried radio, wind driven generator, bomb racks and Very pistol, extra 10 gallon fuel tank, a two gallon tank for drinking water and a vertical camera in the front cockpit. They formed No. 1 Squadron R.I.A.F., helped to suppress the Kurdish rising in 1932 and remained in service until the survivors were destroyed by the R.A.F. action against Iraq on May 2, 1941. The first civil aircraft in Iraq was also a D.H.60M, formerly G. L. P. Henderson's *G-AASD*, which Salim Damel took out as *YI-ASD* in 1932. He flew it to and from England, made eleven crossings of the Syrian Desert to Egypt and did a considerable amount of joyriding all over the Near East. Others were sold for civil use in Argentina, Australia, Belgium, France, Germany, India, Kenya, New Zealand, Spain, Sweden and Switzerland. A D.H.60M seaplane, *N-20*, one of several supplied to Halle and Petersen in Norway, carried the mail between Oslo, Gothenberg, Malmö and Copenhagen with extreme regularity throughout 1929.



D.H.60M *CF-CBN*, c/n 1499, modified in Canada with skis and large semicircular section sliding hood similar to that fitted to Canadian-built Tiger Moths in later years. (De Havilland Photo.)



D.H.60M serial K2235 at Felixstowe in 1931 with scale Singapore force-recording, central float undercarriage. (Imperial War Museum Photo MH.2839.)

Contracts were also placed by the British Air Ministry to Specifications 4/29 and 8/30 and the D.H.60M saw service as a trainer with the Central Flying School and with No. 5 F.T.S., Sealand. It was issued to No. 24 Squadron, Hendon, to Auxiliary Air Force Squadrons and to Station Flights at Andover, Biggin Hill, Boscombe Down, Duxford, Kenley, North Weald, Tangmere, Upavon, Upper Heyford and Worthy Down. At the Hendon R.A.F. Displays in 1930–31, C.F.S. instructors gave impressive performances of inverted flying and formation aerobatics in five D.H.60Ms led by F/Lt. J. S. Chick M.C., A.F.C. and F/Lt. B. E. Embry A.F.C. respectively. A single aircraft J9107 was supplied to the Air Ministry in 1932 to replace a D.H.60X Moth with the same number which had been disposed of on the civil market as *G-ABID*. The replacement machine was used with several others for Fleet Air Arm deck landing training prior to 1939. One 60M, numbered K2235, was assembled from spares by the R.A.E. for use in an experimental role at the M.A.E.E., Felixstowe, where in 1931 it was fitted with a force recording central float undercarriage for taxiing tests on the river with a 1:2.4 scale model of the planing bottom of the Short Singapore II flying boat hull. It was still at Felixstowe in April 1939.

Although mainly for export, over 60 of the type were sold in the United Kingdom to the Brooklands School of Flying Ltd., the de Havilland School of Flying Ltd., National Flying Services Ltd., the Northampton Aero Club Ltd., the oil companies and private owners between 1928 and 1930. *G-AALG* and *G-ABDB* were owned by the Prince of Wales and Duke of Gloucester who flew them with E. H. Fielden, D. Don and other Royal safety pilots.

The D.H.60M Moth was also very suitable for attacks on the Australia record, the first to use it being E. L. Hook and J. Matthews who left Lympne on June 20, 1930 in *G-AAWV*, but crashed at Tomas, Burma on

July 3rd where Hook died in tragic circumstances. Piloted by Oscar Garden, *G-AASA* left Heston on October 17th and flew to Wyndham in 18 days, later going on to New Zealand by boat, but a third machine, *G-ABHY*, broke the record. This long range single seater had the new 120 h.p. Gipsy II engine, the designs for which had been started by Maj.



Alan S. Butler leaving Heston in his special Gipsy II D.H.60M *G-AAXG*, c/n 1542, during the 1930 Round Europe touring competition. The centre section struts were non-standard. ('Flight' Photo 9199.)

Halford on July 1, 1929. The capacity of the earlier Gipsy was raised slightly, it was strengthened for higher output, the valve gear was enclosed and the delivery of production engines began on May 6, 1930. Flown by C. W. A. Scott, 'HY' covered the 10,500 miles in 9 days 4 hours 11 minutes, and between May 26 and June 5, 1931 the same pilot lowered the record in the opposite direction in another D.H.60M *VH-UQA*. During a stay in England it toured the country with the owner's air display, becoming *G-ACOA* in the process, but in the following year again lowered the record when Scott arrived at Darwin on April 28, 1932, 8 days 20 hours 47 minutes after leaving Lympne. Two years later Jean Batten, last of the long distance Moth pilots, broke the women's record at her third attempt by arriving at Darwin in just under 15 days in *G-AARB* on May 28, 1934.

Unusual modifications to the D.H.60M Moth were few although some of the Gipsy II engines were fitted with a revised exhaust system with the main pipe under the fuselage, instead of on the port side. One special machine *G-AAXG* was built with Gipsy II engine in 1930 as a mount for A. S. Butler in the Round Europe Challenge de Tourisme Internationale. A streamlined transparent canopy covered the front cockpit, entry to which was facilitated by repositioning the main centre section struts. After the event the aircraft was sold as *F-AJZB* to Edouard Bret, a prominent French owner who flew it to victory in the 1930 Zenith Cup Race round France, averaging 112 m.p.h. for the 1,036 miles. He returned

it to the makers in 1933 and it was then shipped to New Zealand where, nearly 30 years later, it was still airworthy at Hawkes Bay as *ZK-AEJ*. Standard coupé tops were fitted to special order as in the case of *G-AATA* which went to Croydon in 1929 for executive use by W. B. Dick and Co. Ltd., and some D.H.60Ms supplied to the Chinese Government, including an unregistered example c/n 1432, for Marshal Chiang Hoenk Liang.

Abnormal open models were confined to three special aircraft *G-AAKP*—'KS for National Flying Services Ltd. and an unregistered Belgian military D.H.60M c/n 1717 granted a C. of A. on July 8, 1931. The former were powered by the Cirrus III, standard engine of the company's large fleet of D.H.60X Moths but the other, ordered for the personal use of Capt. Chevalier Willy Coppens, Belgian Military Attaché in London and Paris, who had only one leg, was fitted with a wheel-operated rudder control, and is almost certainly the Moth on charge to the 'Allied Flight' as *MX463* at Hendon in 1942.

It is uncertain whether a single D.H.60M, *BH727*, ordered in 1940 under A.M. Contract B156034/40 was ever built.

With Moths becoming collectors items of considerable value in the late '70s and '80s a number of Moth Corporation D.H.60GMWs were imported into the U.K. commencing with C. C. Lovell's *N585M* which flew for a time under American registration before being allocated the period marks *G-AAMY* in May 1980. It was followed by H. Moffatt's *G-AADR*, the former *NC939M*, R. J. Parkhouse's *G-AAMX*, ex *NC926M*, and R.W. Livett's *G-AAVJ*, once *NC573N*, which all emerged in immaculate condition after rebuild in the mid-'80s.

One British built D.H.60M, *G-AAHY*, sold to Switzerland as *HB-AFI* in 1937, was rebuilt for owner I. White by The Aeroplane Company (Hamble) Ltd. in 1985 and finished in the distinctive red and black colours of the pre-war Brooklands School of Flying.

SPECIFICATION AND DATA

Manufacturers:	The de Havilland Aircraft Co. Ltd., Stag Lane Aerodrome, Edgware	
	The de Havilland Aircraft Pty. Ltd., Bankstown, Sydney, N.S.W.	
	Some airframes assembled by de Havilland Aircraft of Canada Ltd., Downsview Airport, Toronto	
	Haerens Flyvemaskinefabrik, Kjeller, Norway	
	The Munitions Supply Board Ordnance Factory, Maribyrnong, Melbourne	
Power Plants:	One 90 h.p. A.D.C. Cirrus III	
	One 100 h.p. de Havilland Gipsy I	
	One 120 h.p. de Havilland Gipsy II	
Dimensions:	Span 30 ft. 0 in.	Length 23 ft. 11 in.
	Height 8 ft. 9½ in.	Wing area 243 sq. ft.
Weights:	Tare weight 962 lb.	
	All-up weight 1,750 lb.	

Performance:	(Landplane)	Maximum speed 105 m.p.h. Initial climb 700 ft./min. Range 320 miles	Cruising speed 85 m.p.h. Ceiling 18,000 ft.
	(Seaplane)	Maximum speed 98 m.p.h. Initial climb 480 ft./min. Range 250 miles	Cruising speed 75 m.p.h. Ceiling 13,000 ft.

Pre-Production:

	Constructor's No. and Registration	C. of A. Issued	Remarks
339	<i>G-AAAR</i>	29.10.28	First flown 6.9.28, sold in Canada 11.28 as <i>G-CAVX</i>
340	<i>G-AACD</i>	31.10.28	British demonstrator
341	<i>NC973J</i>	11. 1.29	Moth Aircraft Corporation
342	<i>G-AACU</i>	10. 4.29	D.H. School of Flying, impressed 6.40 as <i>AV995</i>
349	—	—	Believed not completed
350	—	—	

Production:

(a) British

Constructor's Numbers	Aircraft markings
711-712	<i>G-AUKC, VH-ULL</i>
713-760	R.C.A.F. 66, 64, 65, R.C.A.F. 67, 68, 69, R.C.A.F. 70, 71, 72, 74, R.C.A.F. (38), (c/n 729, 731, 732, 733, 753, 755, 757 and 760 diverted as <i>CF-CAA</i> , ' <i>AH</i> ', ' <i>AD</i> ', ' <i>AE</i> ', ' <i>AF</i> ', ' <i>AI</i> ', <i>G-CYXE</i> and ' <i>YY</i>)
761-775	Ontario, <i>CF-OAC, G-CAOU*</i> , <i>CF-AAF</i> , ' <i>OAD</i> ', ' <i>CAP</i> ', ' <i>AAB</i> ', ' <i>AG</i> ', ' <i>AH</i> ', ' <i>AE</i> ', ' <i>DH</i> ', ' <i>DF</i> ', <i>CF-CAL</i> , ' <i>AM</i> ', ' <i>AN</i>
776-800	<i>CF-CAO</i> , ' <i>ADG</i> ', ' <i>DJ</i> ', ' <i>DA</i> ', ' <i>DV</i> ', ' <i>DI</i> ', ' <i>DB</i> ' to ' <i>DE</i> ', R.C.A.F. 118-122, <i>CF-ADK</i> , ' <i>AI</i> ', ' <i>AJ</i> ', <i>CF-CAV</i> , <i>CF-ADL</i> , ' <i>DM</i> ', ' <i>DQ</i> ', ' <i>DR</i> ', ' <i>DN</i> ', ' <i>DO</i>
1300-1325	<i>CF-ADY</i> , ' <i>DX</i> ', ' <i>AA</i> ', <i>CF-CAS</i> , <i>CF-ADP</i> , <i>CF-CAT</i> , ' <i>AU</i> ', ' <i>AW</i> ', ' <i>AX</i> ', <i>G-CYWY</i> , <i>CF-AFB</i> , <i>CF-CBG</i> , U.S. Embassy, <i>CF-ADZ</i> , ' <i>DU</i> ', ' <i>DT</i> ', ' <i>DW</i> ', ' <i>GD</i> ', <i>CF-CBE</i> , ' <i>BF</i> ', <i>CF-AGC</i> , ' <i>PB</i> ', ' <i>PA</i> ', ' <i>GF</i> ', ' <i>GG</i> ', ' <i>GE</i>
1326-1350	<i>CF-CBH</i> , <i>CF-AGH</i> , ' <i>GI</i> ', untraced (2), <i>CF-AGM</i> , <i>G-AAGE</i> , <i>SE-ABY</i> , R.C.A.F. 117, Peru, <i>G-AAFB</i> , <i>G-ABSF</i> , <i>G-AAFF</i> , <i>N-42</i> , untraced, <i>CF-APM</i> , untraced, <i>CF-AGK</i> , <i>CF-CEB</i> , untraced (4), <i>CF-AGJ</i> , untraced
1351-1375	<i>CF-AGL</i> , <i>G-AAHB</i> , <i>CF-AGN</i> , R.A.A.F. (8), <i>G-AAHY</i> , ' <i>IF</i> ', <i>VH-ULW</i> , <i>G-AAKB</i> , <i>VH-ULY</i> , South Africa, <i>VH-UNF</i> , <i>G-AAKV</i> , <i>VH-UOA</i> , ' <i>MZ</i> ', ' <i>MJ</i> ', <i>N-35</i> , <i>G-AAJX</i> , <i>VT-AAY</i>
1376-1400	<i>VH-UMU</i> , ' <i>MD</i> ', airframe to SCADTA**, <i>VH-UMO</i> , <i>G-AAKW</i> , <i>OO-AKM</i> , <i>J9931</i> , <i>J9932</i> , <i>J9922-J9930</i> to the R.A.F. under A.M. Contract 912850/29, <i>VT-ABA</i> , <i>G-AAKP</i> —'KS, <i>D-1737</i> , <i>VH-UNE</i> , ' <i>MR</i> ', ' <i>NX</i>
1401-1425	<i>VH-UOZ</i> , <i>G-AALF</i> , <i>VH-ULM</i> —'LP, ' <i>NP</i> ', ' <i>NB</i> ', <i>G-AALS</i> , ' <i>LX</i> ', ' <i>LG</i> ', ' <i>RB</i> ', ' <i>RI</i> ', ' <i>RD</i> ', Argentina, <i>G-AARL</i> , ' <i>RH</i> ', <i>VH-UNL</i> , ' <i>NN</i> ', <i>VT-ABM</i> , <i>VT-ABO</i> , <i>VH-UND</i> , <i>VT-ABP</i> , <i>G-AARU</i> , airframe to SCADTA
1426-1449	<i>VP-KAF</i> , <i>MW-124</i> , <i>MW-125</i> , Argentina, <i>G-AASL</i> , <i>VH-UNI</i> , Shanghai, <i>G-AASM</i> , ' <i>SZ</i> ', Norwegian Army 101, 103, <i>CH-251</i> , <i>G-AASA</i> , ' <i>SF</i> ', ' <i>SD</i> ', ' <i>SR</i> ', Norwegian Army 105, <i>F-AJKT</i> , <i>VH-UNU</i> , Danish <i>S-106</i> , <i>S-107</i> , <i>ZK-ABF</i> , ' <i>BE</i> ', ' <i>BA</i>
1450-1475	<i>K1103-K1112</i> to the R.A.F. under A.M. Contract 932183/29, <i>G-AATA</i> , Argentina, <i>G-AAUH</i> , <i>F-AJLV</i> , <i>VH-UNQ</i> , <i>F-AJLX</i> , <i>VT-ABR</i> , <i>G-AATB</i> , <i>F-AJLQ</i> , <i>ZS-ABT</i> , <i>VT-ABL</i> , ' <i>BK</i> ', <i>G-ABAI</i> , <i>D-1800</i> , <i>G-AAWU</i> , airframe to Morane-Saulnier

* Replacement for D.H.60X, c/n 400.

**Sociedad Colomba-Alemana de Transportes Aereos, Colombia.

Constructor's Numbers	Aircraft markings
1476-1499	<i>G-AAWV, 'US, VH-UOI, CH-253, G-AAVZ, Argentina, G-AAVR, VH-UOQ, 'OR, G-AAVU, 'VV, ZK-ABT, 'BS, CF-CBK, 'BL, VT-ABQ, CF-CBM, G-AAVE, VH-UOK, G-AAUI, VH-UVO, CF-CBP, 'BO, 'BN K1218-K1227, K1198-K1217 to the R.A.F. under A.M. Contract 5785/30</i>
1500-1529	
1530-1550	<i>VH-UOT, Shanghai, VT-ABH, 'BI, N-20, G-AAZF, SCADTA (2)**, G-AAZI, G-ABAS, 'AT, MW-131, G-AAZG, G-ABDT, D-1869, SP-ADY, G-AAYG, G-ABBL, D-1921, G-ABAN, Argentina</i>

** Sociedad Colomba-Alemana de Transportes Aereos, Colombia.



D.H.60M Moth K1852, photographed at Lympe in 1932, was a communications aircraft with No. 601 Squadron, Hendon. (A. J. Jackson Photo.)

Constructor's Numbers	Aircraft markings
1551-1569	<i>VT-ACE, G-ABCW, 'CH, ZK-ACD, G-ABCZ, 'PJ, 'DB, VH-UPD, Bandoeng, R.N.Z.A.F. 1560, ZK-ACE, 'CF, 'CH, 'CI, VH-UQY, 'QA, R.N.Z.A.F. 1567-1569</i>
1570-1662	<i>Shanghai (10), K1830-K1849, K1860-K1883, K1850-K1859, K1884-K1907, K1825-K1829 to the R.A.F. under A.M. Contract 27847/30</i>
1663-1671	<i>Argentina, Shanghai (5), VP-KAI, Shanghai, SE-ACN</i>
1673-1699	<i>Argentina, D.H. Co. Ltd., Iraqi Air Force Nos. 1-5, G-ABHN, J9107 for Royal Navy replacing D.H.60X, c/n 514, Danish Naval Air Service Nos. 145-147, G-ABHY, Swedish Air Force, PK-SAF, Shanghai (5), Argentina, Shanghai (4), G-ABMX, Shanghai</i>
1706-1717	<i>G-ABNR, Shanghai (2), Austrian A-78, Shanghai, G-ABNA, G-ABPA, VT-ABX, Shanghai (3), Willy Coppens</i>
1723	<i>Shanghai</i>
1776-1795	<i>Iraqi Air Force (4), Shanghai (14), G-ABRF, VT-ACK</i>
1797-1798	<i>VT-ACM, G-ABTF</i>
3027-3029	<i>VT-ACN, G-ABXM, SE-ADC</i>
3034-3035	<i>VT-ADL, 'DS</i>
3048-3049	<i>VT-ADR, ZK-ACZ</i>
3053-3056	<i>Untraced, VT-AEI, 'ET, 'FC</i>

(b) Assembled in Canada

Constructor's Numbers	Aircraft markings
DHC.101-135	<i>R.C.A.F. 157-162, 151-156, 163-168, CF-ALV, CF-OAE, 'AG, 'AF, CF-CBY, 'BX, CF-AGR, 'GP, 'GX, CF-CBQ, 'DA, untraced, CF-CDC, CF-APN, CF-AVF (later, R.C.A.F. 223), CF-OAE, CF-AGZ</i>

(c) Built by the Moth Aircraft Corporation

Constructor's Numbers	Aircraft markings
2A-23A	<i>NC894E, NC300H-NC302H, NC857H, export (17)</i>
41-100	<i>NC229K-NC237K, NC556K-NC566K, NC961H-NC970H, NC55M-NC64M, NC580M-NC589M, NC131M-NC140M</i>
101-150	<i>NC900M-NC919M, NC922M-NC941M, NC215V-NC222V, NC969K, NC970K</i>
151-179	<i>NC713M-NC717M, NC572N-NC578N, NC583N, NC966K, NC590N-NC595N, NC603V-NC605V, NC597N, NC613V-NC617V</i>

(d) Built by Haerens Flyvemaskinefabrik (Norwegian Army Aircraft factory)

Ten aircraft in 1931, odd serials only in the Norwegian Army range 107-125, c/n 137-146.

(e) Built by The Munitions Supply Board Ordnance Factory

Six for R.A.A.F. 10.35 to 6.36 serials A7.69 to A7.74

(f) Others

CF-AYZ, c/n 001, built in Canada from *CF-AAG* and 'DD in 1936 by F. W. Hardwick
CF-OAU, c/n W2, built from spares in 1937 by Ontario Provincial Air Service.

Service Use: K1213-17 at C.F.S. 1930-31; J9922, 23, 24, K1825, 27, 28 at No. 5 F.T.S. Sealand 1930-31; K1835, 53, 84, 90, 92, 96, 97 at No. 15 E.R.F.T.S. Redhill 1937-38; K1112, K1208 at E.R.F.T.S. Barton 1937-38; K1848, 60, 62, 63, 68, 87, 88 at R.A.F. College, Cranwell; K1849, 61, 66, 68, 75, 79, 81, 82, 88, 97 at R.A.F. College of Engineering, Henlow; K1204 with No. 7 Squadron; K1893 with No. 8 Squadron, crashed at Khormaksar 24.7.33; K1877, K1901 with No. 24 Squadron, Hendon; K1852 with No. 601 Squadron; K1831 with No. 604 Squadron; K1111, K1210, 13, K1826, 28, 36, 38, 41, 43, 56, 64 with Air Defence of Great Britain Communications Flights 1932-33; K1215, 21, K1846, 48 with Home Command Flight, Hendon 1932; K1219, K1845 with A.A.S. Eastchurch 1933-34; K1215 with A.A.S. Sutton Bridge 1934-35; K1107, K1202 with 'A' Flight, Base Training Squadron, Gosport 1934; K1200, 01 at the Air Depot, Hinaidi 1935-36.

Civilian Disposal: J9922 to the makers 6.31 as *G-ABNE*; K1202, K1828 to the R.A.F. Flying Club, Hatfield 7.35 as *G-ADLJ*, 'LK; K1227 to A. H. Wheeler 10.38 as *G-AFKM*; K1845, 60 to the Hampshire School of Flying Ltd., Eastleigh 8.39 as *G-AFZB*, 'WJ; K1907 to the Midland Bank Flying Club, Maylands 1.39 as *G-AFMY*.

Other Disposals: K1210 in air collision with Bristol Bulldog K1677 over Kenley 14.11.31; K1827 in air collision with Bristol Fighter H1634 over Sealand 5.30; K1838 in air collision with Siskin at Seahurst Park, Sussex 23.4.31; K1849 to Maintenance Command as 709M; K1862 to Nottingham A.T.C.



The Swiss Moth Major *HB-UPE*, first delivered to Werner Ochetti in June 1934 as *CH-348*, was still flying at Lausanne more than 50 years later. (*M. Fricke Photo.*)

De Havilland D.H.60GIII Moth Major

Light aero engine design made an important advance in 1930 when several well proven power units were modified to run successfully upside down. De Havillands inverted their 120 h.p. Gipsy II engine, kept the oil in the sump by means of internal modifications based on the unspillable inkpot principle, and renamed it the Gipsy III. When fitted to the wooden Moth airframe, a new de luxe variant known simply as the D.H.60GIII Moth was created for the private pilot and the flying clubs. Cowlings for the new engine faired quite naturally into the lines of the fuselage and the cylinders being underneath, the pilot's forward view was very considerably improved. The prototype, *G-ABUI*, first flew in March 1932 after which a production line was established at Stag Lane and constructor's numbers in the 5,000 series were entirely reserved for the D.H.60GIII. This conformed to the very logical block system which de Havillands adopted for all subsequent types for ease of airframe identification and simplification of production records.

Orders for the D.H.60GIII Moth came from all over the world—the first two production machines went to Misr Airwork for school flying at Almaza, Cairo; the fourth, *G-ABWT*, was flown from Woodley to Nairobi as *VP-KAR* by H. W. Sear in May of that year and others were despatched to Argentina, Australia, Belgium, Eire, India, Kenya, Lithuania, Nyasaland, the Netherlands, Portugal, South Africa, Sweden and Switzerland.

The third production aircraft, *G-ABVW*, was a special high performance single seater fitted with an experimental 133 h.p. Gipsy IIIA high compression engine for H. S. Broad to fly in the 1932 King's Cup Race. He came fifth but his average speed of 131.34 m.p.h. was quite exceptional for a Moth and attracted the attention of Miss Amy Johnson for whom *VW* was fitted with a standard Gipsy III and named "Jason 4". The Gipsy IIIA engine later went into production as the 130 h.p. Gipsy Major, an early example of which powered the Hon. R. Westenra's single seat Moth *G-ACCW* which averaged 118.55 m.p.h. in the 1933 King's Cup Race. Both these special Moths competed in most of the 1933–34 air races but only Lawrence Lipton, the new owner of "Jason 4", was successful. He came third in the 1933 Folkestone Trophy and 1934 King's Cup Races, second in the Yorkshire Trophy Race and won the Brooklands–Cramlington race at an average speed of 124.02 m.p.h.

The Gipsy III Moth also had one long distance solo flight to its credit. Senor Carlos Bleck, who had owned each type of de Havilland Moth in turn, left Lisbon in *CS-AAI* on February 19, 1934 and reached Nova Goa, Portuguese India in 14 days, averaging 105 m.p.h. for the 6,600 miles.

Having conformed to Moth tradition and started its career in the fields of air racing and long distance flying, the D.H.60GIII settled down to its main role as a private and club aircraft. Of the 57 built, 30 were registered to British private owners and to the Ipswich, Midland, London Transport, Leicestershire, Hull, Scottish, Edinburgh and Cinque Ports clubs, and ten fuselages were diverted to an Air Ministry contract for pilotless target aircraft as described in the chapter on the Queen Bee. Many were later sold abroad including Lipton's special machine which went to the Netherlands as *PH-ART* in August 1937 and others went to Austria, India, Italy, Sourabaya and Sweden. Apart from two serious crashes in Scotland involving the Scottish Flying Club's *G-ABZT* in the Isle of Islay



Four Moth Majors, c/n 5126, '27, '29 and '30, used by the Austrian Aero Club from 1936 for training military pilots. (*The Aeroplane' Photo.*)



Belgian registered D.H.60GIII Moth *OO-GUY* which was flown to Lympe in 1933 by owner Guy Hansez in company with D.H.60M *D-EGAT*. (C. A. Nepean Bishop Photo.)

and the Edinburgh Club's *G-ACGD* on Broad Law, Peeblesshire in 1936, the remainder gave faithful service for many years and five were impressed into the R.A.F. in 1940.

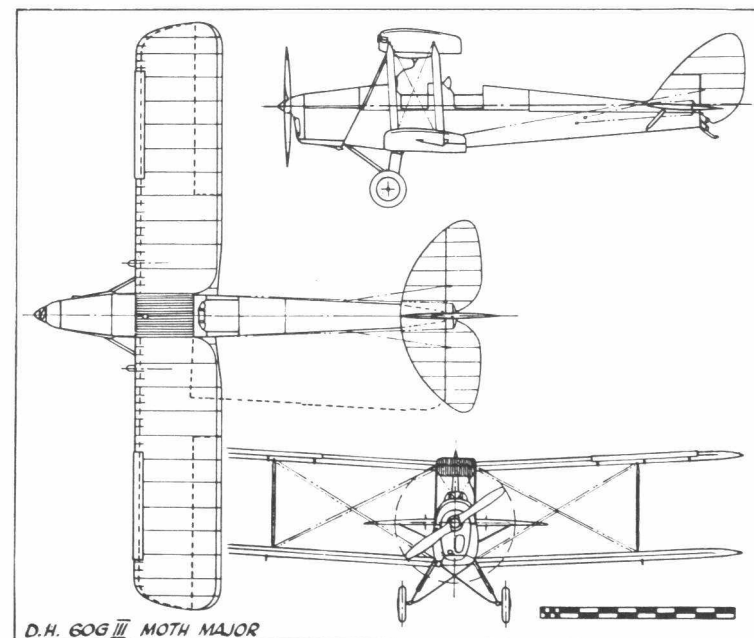
Commencing with the fifty-eighth airframe in February 1934, the type name was changed to Moth Major to mark the introduction of the Gipsy Major as the standard engine. Despite the change of power plant the designation D.H.60GIII was retained, but precise identification was possible only by an inspection of the fins of No. 1 cylinder through the air intake. The cooling fins of the Gipsy Major tapered towards the crank case and those of the Gipsy III did not. Following the disposal abroad of the prototype *G-ACNP*, production continued until May 1935, by which time 96 had been built. As before, ten fuselages were diverted to the Air Ministry Queen Bee contract and a considerable number were shipped abroad to Australia, Austria, China, Denmark, Finland, Greece, India, New Zealand, Penang, Singapore, Southern Rhodesia, Spain, Sweden and Switzerland. Twelve flown to Spain in December 1934 became Air Force trainers and one diverted from the Queen Bee contract went to the Indian Air Force with a C. of A. dated January 8, 1935. The Bombay Flying Club was also equipped with Moth Majors which each summer from 1934 to 1938 made a formation training flight to England.

Twenty-seven Moth Majors were to British order, the principal user being the Midland Aero Club at Castle Bromwich which acquired *G-ACNR*, 'OG', 'OH' and 'OI' in May 1934, handing over four elderly Cirrus Moths in part exchange, including the historic *G-EBLT* received under the Air Ministry subsidy scheme in 1925. A fifth aircraft, 'TW', was added to the fleet later in the year but 'OH' was lost in a fatal air collision with a Hawker Hart over the aerodrome on December 9, 1934. Seventeen British owned Moth Majors were eventually sold abroad, mainly to satisfied users in the countries listed above, and one, *G-ACUC*, was flown from Lympe to Darwin by Miss Freda Thompson between September 28 and November 10, 1934. The rest were used for school work by the

Hampshire, Edinburgh, Bristol, Portsmouth, Tollerton and London Transport clubs as well as with private owners. One, *G-ACUR*, was owned by aviation's grand old lady, the Duchess of Bedford, who kept it at Woburn Abbey. After her record breaking trips to India and Africa with C. D. Barnard in the Fokker F.VIIA "Spider", she was taught to fly by Sydney St. Barbe in 1934 and after further instruction from her personal pilot F/Lt. R. C. Preston she did a considerable amount of solo flying. On March 23, 1937 at the age of 72, she took off solo in 'UR and was presumed lost at sea after the interplane struts were washed ashore at Great Yarmouth on April 2nd.

Several examples of the D.H.60GIII Moth and Moth Major survived the war in neutral countries such as Sweden and Switzerland but the vast majority were lost either by enemy action or as the result of impressment into the various air forces of the Commonwealth. The single example to survive in the United Kingdom, *G-ADHE*, completed 11 years of postwar flying until it came to grief at Denham on March 22, 1958. It still carried markings which included the initials of its original owner, H. E. Evans, by whom it was used for business trips between Heston and India 1935-38.

In early 1986 the sole airworthy Moth Major was the Groupement Avions Historiques' *HB-UPE* though it was soon to be joined by R. E. Ogden's former Swedish machine *G-ABZB*, the rebuild of which was well advanced, and J. A. Chicarro's *EC-ADE*, which was shipped to U.K. for rebuild by C. C. Lovell in December of that year.



SPECIFICATION AND DATA

Manufacturers: The de Havilland Aircraft Co. Ltd., Stag Lane Aerodrome, Edgware, Middlesex

Power Plants: One 120 h.p. de Havilland Gipsy III
One 133 h.p. de Havilland Gipsy IIIA
One 130 h.p. de Havilland Gipsy Major

Dimensions: Span 30 ft. 0 in. Length 23 ft. 11 in.
Height 8 ft. 9½ in. Wing area 243 sq. ft.

Weights: (Gipsy III) Tare weight 1,005 lb. All-up weight 1,750 lb.
(Gipsy Major) Tare weight 1,040 lb. All-up weight 1,750 lb.

Performance: (Gipsy III) Maximum speed 108.5 m.p.h.
Cruising speed 92 m.p.h. Ceiling 18,750 ft.
Initial climb 780 ft./min. Range 320 miles
(Gipsy Major) Maximum speed 112.5 m.p.h.
Cruising speed 96 m.p.h. Ceiling 20,000 ft.
Initial climb 892 ft./min. Range 300 miles

Production:

(a) D.H.60GIII Moth

Constructor's Numbers	Aircraft markings
5000-5026	<i>G-ABUI, SU-ABC, 'BB, G-ABVW, 'WT, 'XX, OO-GUT, G-ABYY, G-ABYZ, VT-ADP, OO-GUY, G-ABZB, 'ZK, India, G-ABZS-'ZV, SE-ADN, VP-KAU, G-ACBX, ZS-ADF, G-ACCW, 'DV, SE-ADO, G-ACGD, 'HH</i>
5028-5037	<i>Kenya, G-ACGX, 'GZ, RY-LAL, EI-AAU, G-ACIA, 'IB, 'JB, 'II, 'IK</i>
5040-5043	<i>PH-AJI, CH-359, G-ACKF, PP-TEG</i>
5047	<i>G-ACMF</i>
5052-5056	<i>VH-URL, CS-AAI, VT-AFA, G-ACMY, VP-NAC</i>

(b) D.H.60GIII Moth Major

Constructor's Numbers	Aircraft markings
5057-5088	<i>G-ACNP, 'OF, Argentina (2), G-ACNL, 'NM, Penang, VR-SAB, 'AC, OY-DAH, G-ACNR, 'NS, CH-369, G-ACOG-'OI, G-ACPH, OK-ATR, EC-XAA, EC-AXX, G-ACPI, CH-348, G-ACRI, G-ACPT, SX-AAA, G-ACRR, export, G-ACUC, VH-URR, 'RS, G-ACSA, 'ST</i>
5091-5098	<i>G-ACTW, VT-AFL, HB-UBO, 'UTI, G-ACXK, VT-AFP, G-ACUR, EC-YAY</i>
5100-5115	<i>G-ACYD, EC-W28 to EC-W39, G-ACZX, ZK-ADK, 'DL</i>
5117-5126	<i>VR-SAK, ZK-ADM-'DP, G-ADAN, VP-YAV, 'AW, OE-TAM, 'TEM</i>
5129-5133	<i>OE-TIM, TOM, OY-DIK, SE-AGF, VR-HCU</i>
5138-5152	<i>OY-DAK, EC-W47, VT-AGK, Spanish Naval Air Service, VT-AGL, G-ADFK-'FM, OE-TUM, G-ADHE, OE-TAE, 'TEE, 'TIE, 'TOE, 'TUE</i>

Note: An additional Moth Major, *G-ADIO*, c/n 2263, was built by the de Havilland Aeronautical Technical School in 1935.



D.H.60T dual control trainer *Fv.5110*, c/n 1720, of the Swedish Air Force. The revised flying wire anchorage and forward facing exhaust are well illustrated. ('Flight' Photo 10146.).

De Havilland D.H.60T Moth Trainer

The Moth reached its ultimate development in 1931 with the appearance of the D.H.60M with Gipsy II engine, extensively modified for military training as the D.H.60T Moth Trainer. Although intended primarily for pilot training with full dual control, the new variant could be fitted quickly and easily with interchangeable specialist equipment such as a camera gun, a rack for four 20 lb. practice bombs under the centre fuselage, radio, or aerial cameras. It could thus be used for fighter training, practice or offensive bombing, or for signals and reconnaissance training.

These extra loads made it necessary to strengthen the primary structure to permit an increase in maximum all-up weight to 1,820 lb. and entirely new wings, with modified section, ensured the retention of the Moth's characteristic nicety of handling, even at the extra weight. They made the stall less abrupt and slowed down the resultant spin. To ensure ease of parachute escape from the front cockpit, the rear flying wires were taken forward to the front root end fitting of the lower mainplane and the attachment of both flying wires to the same fitting formed the chief external recognition feature of the D.H.60T. Deeper doors were fitted to give greater freedom of exit from the cockpits and by pointing the exhaust pipe of the Gipsy II engine forward and downward under the nose, it was possible to provide doors in the port, as well as in the starboard, side of the fuselage.

The Moth Trainer can thus be regarded as the transitional type between the civilian Gipsy Moth and the Tiger Moth military trainer which appeared later that year, and although only a small number was built, the D.H.60T marked a notable advance in trainer concept. Flight trials with



Brazilian military D.H.60T Moth Trainer civilianised as *PP-TZE* for the Santos Aero Club. Another, *PP-TYF*, was re-engined with a 120 h.p. Walter Major.



SE-BFH, one of three Swedish Air Force D.H.60Ts civilianised by Fiskflyg, which operated from Malmö 1947–51. (Charles W. Cain Photo.)

two prototypes under B conditions at Stag Lane as *E-3* and *E-4* early in April 1931, resulted in an order from Flygstyrelsen, Stockholm for ten aircraft for the Swedish Air Force, delivered by air during the summer of that year. These were allotted local designation *Sk.9*, or on floats, *Sk.9H*. Arnhold and Co. of Shanghai despatched a single example to the Chinese Air Force among its numerous D.H.60Ms, six were supplied to the Egyptian Air Force and five to that of Iraq. After comparative trials between the trainer aircraft of seven nations the Brazilian Government placed the largest single order for the D.H.60T, 40 of which were shipped to Rio de Janeiro in 1932. Fifteen were assigned to the Escola de Aviação Militar for training purposes and the remainder to the Escola de Aviação Navale. The latter carried serials commencing *A1-5* and one of the former is known to have been *K-147*. At the end of their Service lives several were put up for civilian disposal, one becoming *PP-TZE* for the Santos Aero

Club and at least one, *PP-TYF*, was re-engined with a 120 h.p. Walter Major.

Several of the Swedish Moth Trainers, locally designated *Sk.9*, remained on the active list until struck off charge 16 years later in 1947. Subsequently three, *Fv.5104*, *5108* and *5110*, were adapted for civil use by Firma Fiskflyg of Malmö in 1947 as *SE-AZW*, *SE-BFI* and *'FH* respectively and a fourth, *SE-BFB*, was constructed from salvaged parts by Ostkustflyg at Västervik in 1948.

SPECIFICATION AND DATA

Manufacturers: The de Havilland Aircraft Co. Ltd., Stag Lane Aerodrome, Edgware, Middlesex

Power Plants: One 120 h.p. de Havilland Gipsy II
One 120 h.p. Walter Major

Dimensions: Span 30 ft. 0 in. Length 23 ft. 11 in.
Height 8 ft. 9½ in. Wing area 243 sq. ft.

Weights: All-up weight (normal) 1,820 lb. (aerobatics) 1,640 lb.

Performance at the Maximum Permissible Aerobatic Weight:

Maximum speed 106 m.p.h.	Stalling speed 45 m.p.h.
Initial climb 730 ft./min.	Ceiling 15,900 ft.
Range 320 miles	

Production:

(a) Initial

	Constructor's No. and Registration	C. of A. Issued	Remarks
1672	<i>G-ABKU</i>	13. 5.31	First prototype <i>E-3</i> , sold abroad 12.31
1700	<i>G-ABKM</i>	15. 5.31	To Swedish Air Force via Lympe–Antwerp 28.5.31; became <i>Fv.5103</i>
1701	<i>G-ABKN</i>	16. 5.31	To the Swedish Air Force 6.31 as <i>Fv.5104</i> , civil 3.48 as <i>SE-AZW</i> , crashed 6.12.50
1702	<i>G-ABKO</i>	16. 5.31	To the Swedish Air Force 6.31 as <i>Fv.5105</i>
1703	<i>G-ABKP</i>	16. 5.31	To the Swedish Air Force 6.31 as <i>Fv.5106</i>
1704	<i>G-ABKR</i>	16. 5.31	To the Swedish Air Force 6.31 as <i>Fv.5107</i>
1705	<i>G-ABKS</i>	16. 5.31	Second prototype <i>E-4</i> , sold abroad 12.31
1718	<i>Fv.5108</i>	23. 7.31	Swedish Air Force, civil 8.47 as <i>SE-BFI</i>
1719	<i>Fv.5109</i>	23. 7.31	Swedish Air Force
1720	<i>Fv.5110</i>	23. 7.31	Civil 8.47 as <i>SE-BFH</i> , scrapped 6.51
1721	<i>Fv.5111</i>	23. 7.31	} Swedish Air Force
1722	<i>Fv.5112</i>	23. 7.31	

(b) Further

1731	China
1734–1738	Egyptian Air Force <i>E-105</i> , <i>E-104</i> , <i>E-103</i> , <i>E-102</i> , <i>E-101</i>
1799	Egyptian Air Force <i>E-106</i>
3000–3026	Brazilian Army (15), Brazilian Navy <i>A1-5</i> to <i>A1-16</i>
3030–3032	Brazilian Navy, Iraq Nos. 13–14
3036–3047	Brazilian Navy (12)
3050–3052	Iraq Nos. 25–27



Sir Alan Cobham's Jaguar engined D.H.61 *G-AAEV*, c/n 335. ('Flight' Photo 7067.)

De Havilland D.H.61 Giant Moth

In August 1927 de Havillands announced that a large single engined cabin biplane was under construction to meet an Australian requirement for a D.H.50J replacement. It had been designed by a team led by A. E. Hagg in two attics in Fishermans Walk, Bournemouth during a ten week escape from Moth production at Stag Lane. Rolls-Royce Eagle, Napier Lion and Armstrong Siddeley Jaguar engines were specified as alternatives to the Bristol Jupiter demanded by the Australian order. As in the D.H.50J, the pilot sat in an open cockpit aft of the cabin but the new machine, designated D.H.61, was approximately equal in size and loaded weight to the big D.H.34 and structurally simple with plywood and spruce fuselage, two bay equal span, fabric covered wooden wings and strut braced tailplane. Standard de Havilland differential ailerons, oleo damped rubber-in-compression undercarriage, centre section fuel tank and characteristic rudder shape were all there, and to save hangar space the wings were designed to fold. The undercarriage was not of the usual split type, but each wheel had its own steel axle hinged to the opposite longeron so as to cross the other diagonally. The large fuselage cross section permitted generous cabin space for six passengers on curved plywood seats, or eight if the baggage load was reduced to 600 lb. Warm air was taken into the cabin from a muff round the exhaust pipe and Triplex sliding windows were in the familiar D.H.34 tradition. To ensure adequate view for the pilot over and around the abnormally wide cabin, the cockpit was offset to port, raised above the general lines of the fuselage and enclosed in a long streamlined fairing. Space under the cockpit was used for luggage, a second compartment for which was situated between the cabin and the engine bulkhead.

To ensure maximum take off and climb the D.H.61's designers intended to fit a 500 h.p. Jupiter XI geared engine but none could be spared from military contracts for installation in the prototype, *G-EBTL*. It was fitted instead with a direct drive 450 h.p. Jupiter VI turning a two bladed airscrew fitted with a large boss leading smoothly into the profile of the exhaust collector ring. H. S. Broad made the first flights at Stag Lane in December 1927 and conducted trials during January 1928. The aircraft was christened "Canberra", and this was used as a temporary type name until 'Giant Moth' was chosen later in the year. The prototype was shipped to Melbourne and erected at Essenden by de Havilland Aircraft Pty. Ltd., test flown on March 2, 1928 and then handed over to the MacRobertson Miller Aviation Co. Ltd. who renamed it "Old Gold" for the new scheduled service between Adelaide and Broken Hill. After service with West Australian Airways in 1931 it was sold finally to Guinea Airways Ltd.

Ten Giant Moths were built and Jupiter XI geared engines were made available for installation in production aircraft. Two of these, *G-CAJT* and 'PG', were fitted with Short twin metal floats of generous proportions and the first was test flown at Rochester by H. S. Broad in June 1928. Both aircraft were used almost exclusively for uplifting fire fighters and their equipment, landings being made on Canada's innumerable lakes and rivers near to the scene of forest fires reported by patrolling Moths. *G-CAJT*, a floatplane ordered by Canadian Vickers Ltd., was leased to Western Canada Airways Ltd. (on wheels) but was very soon burned out in a forced landing. *G-CAPG* joined the Ontario Provincial Air Service (on floats) at its Sioux base and flew 120 hours in its first month's service. The final Giant Moth, *G-CARD*, first flown by Hubert Broad on July 23, 1928,



The second production D.H.61 Giant Moth, c/n 328, with Bristol Jupiter XI, being launched at Rochester in June 1928. ('Flight' Photo 5847.)

visited Croydon briefly on the 28th before shipment to London Air Transport Ltd. in Ontario. It was never licensed and it is probable that components of this aircraft were used in the construction of *CF-OAK*, modified to take a Pratt and Whitney Hornet geared radial engine driving a three bladed Hamilton adjustable pitch metal airscrew by de Havilland Aircraft of Canada Ltd. This was a major rebuild involving considerable redesign of the engine mounting. Four days after its first flight piloted by Leigh Capreol in June 1932, *OAK* was combating forest fires in Northern Ontario where it remained in service until it sank through striking a submerged rock when landing on Gander Lake four years later. The work of fitting *G-CAPG* with a Hornet was done later by the owners, who also equipped both aircraft with Fairchild floats.

At the end of 1928 when the Larkin Aircraft Supply Co. Ltd. and QANTAS successfully tendered for subsidised weekly air mail services over the Camooweal–Daly Waters and Brisbane–Charleville routes, three Jupiter XIF powered D.H.61s were purchased at £5,340 each, ex works, to supplement the D.H.50Js. *G-AUHW*, also named “Canberra”, was delivered to the Larkin-sponsored Australian Aerial Services Ltd. at Melbourne while *G-AUJB* (initially mispainted ‘JD’) and ‘JC’ were erected at Archerfield, Brisbane and named “Apollo” and “Diana” in the same mythological series as the QANTAS D.H.50s. Capt. P. H. Moody flew “Apollo” on the inaugural 444 mile service to Charleville on April 17, 1929 but both D.H.61s were plagued by recurring engine problems and were re-engined temporarily with the reliable 450 h.p. Jupiter VI engines used in the D.H.50s, with inevitable loss of performance and payload.

The Jupiter XIF’s difficulties were eliminated in 1930 and “Apollo” (Capt. R. B. Tapp) also featured prominently in the first Australia–England air mail run, leaving Brisbane on April 25, 1931 with 17 bags of mail to be handed over to Kingsford Smith and the “Southern Cross” at



D.H.61 *G-AUHW* at Longreach in 1929 en route from Melbourne to join Australian Aerial Services Ltd.’s Camooweal–Daly Waters route. (QANTAS Photo.)

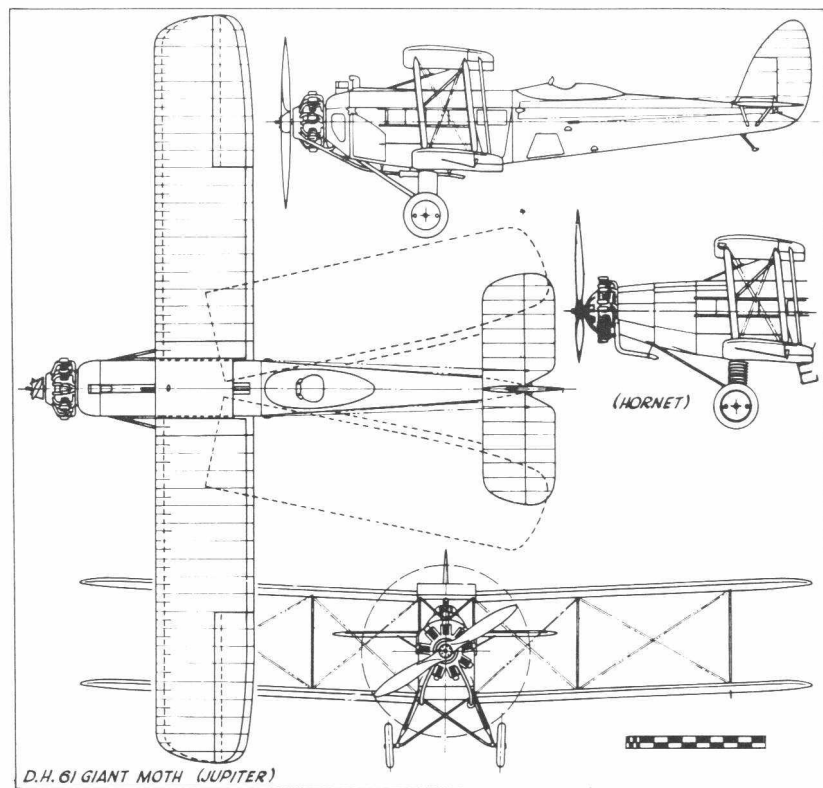


The D.H.61 “Geraldine”, used by the *Daily Mail* in 1928, was powered by a Bristol Jupiter XIF driving a four bladed wooden airscrew. It is seen here at Le Bourget. (‘*Daily Mail*’ Photo.)

Darwin the next day. When the regular service opened in 1934, QANTAS again fell back on the two Giant Moths while its new D.H.86s were grounded pending investigations into the unexplained crash of *VH-USG*. “Diana” (Capt. G. U. Allan) left on the first southbound service from Darwin with 103 lb. of mail on December 19, 1934.

Giant Moth production included two to British order, the first of which, *G-AAAN* “Geraldine”, fitted with a Bristol Jupiter XI, was delivered to Associated Newspapers Ltd. in October 1928. It was used by the *Daily Mail* for rapid news gathering and carried a motor cycle to enable the photographer or reporter to reach the scene of interest without delay. Negatives were developed in the cabin darkroom during the return flight while the story was being typed on a folding desk. “Geraldine” was thus employed for some 18 months, visiting all parts of Europe and the British Isles, becoming on October 9, 1929 the first aeroplane passed ‘A.1 at Lloyds’. National Flying Services Ltd. bought it in February 1930 and renamed it “Leone” for taxi work and pleasure flying. At the flying meeting at Woodley on April 5, 1930 Capt. A. J. Styran made 40 flights and carried 320 passengers but “Leone” was normally based at Hedon, Hull. Two years later it was shipped to New Guinea to replace the crashed D.H.37 on goldfield freighting flights, first with Holden Air Transport Services Ltd. and later with Guinea Airways Ltd. It joined the former Larkin “Canberra” *VH-UHW*, in which Capt. Les Holden had flown half across Australia in search of Kingsford Smith and the missing “Southern Cross”. He located them in the remote north west on April 12, 1929 and later acquired the aircraft for his new company in New Guinea, whither both QANTAS Giant Moths gravitated for freighting under various ownerships until they inevitably succumbed to hard usage.

Alan Cobham Aviation Co. Ltd. took delivery of the second British Giant Moth *G-AAEV* “Youth of Britain” at Stag Lane on May 14, 1929



in readiness for a 21 week propaganda tour of towns and cities in the British Isles. Unlike its predecessors it was powered by an Armstrong Siddeley Jaguar VIC engine for driving a two bladed airscrew and was furnished as a ten seater for short haul work. In an attempt to convince local authorities that municipal aerodromes were a necessity, Sir Alan Cobham gave short flights to some 3,500 mayors and members of corporations from existing or improvised aerodromes. Through the generosity of Sir Charles Wakefield, 10,000 school children were also given free flights. The tour ended at Stag Lane on October 7, 1929 and on December 10th Cobham left for Africa to deliver the aircraft to Imperial Airways Ltd. An uneventful flight via Pisa, Tripoli, Heliopolis, Khartoum and Nairobi, brought him to the flooded aerodrome at N'dola on January 1, 1930. Although bogged for many hours he succeeded in handing 'EV' over to an Imperial crew at Salisbury, Southern Rhodesia on January 7th but two weeks later it turned over and broke up in a crash landing at Broken Hill.

In Japan the Mitsubishi company built an aircraft to the same specification powered by an Armstrong Siddeley Jaguar and designated the C.1.

It could only be regarded as a flagrant, if unlovely and angular, copy of the Giant Moth. Equipped with twin floats it was registered *J-BAKG*.

SPECIFICATION AND DATA

Manufacturers: The de Havilland Aircraft Co. Ltd., Stag Lane Aerodrome, Edgware, Middlesex

Power Plants: One 450 h.p. Bristol Jupiter VI
One 500 h.p. Bristol Jupiter XIF
One 500 h.p. Armstrong Siddeley Jaguar VIC
One 525 h.p. Pratt and Whitney Hornet

Dimensions: Span 52 ft. 0 in. Height 13 ft. 1 in. (Seaplanes) 14 ft. 5 in.
Length (Seaplanes) 39 ft. 8 in.

Lengths, Weights and Performances:

	Jupiter VI	Jupiter XI and Jaguar VIC	Hornet
Length . . .	38 ft. 9 in.	39 ft. 0 in.	38 ft. 10 in.
Tare weight . . .	3,465 lb.	3,650 lb.*	3,640 lb.**
All-up weight . . .	6,200 lb.	7,000 lb.	7,000 lb.
Maximum speed . . .	126 m.p.h.	132 m.p.h.	132 m.p.h.
Cruising speed . . .	105 m.p.h.	110 m.p.h.	110 m.p.h.
Initial climb . . .	650 ft./min.	900 ft./min.	900 ft./min.
Ceiling . . .	15,000 ft.	18,000 ft.	18,000 ft.
Range . . .	475 miles	450 miles	430 miles

* Seaplane 4,050 lb.

** Seaplane 4,028 lb.

Production:

	Constructor's No. and Registration	C. of A. Issued	Remarks
325	G-EBTL	14. 1.28	Prototype; "Canberra", to Australia 2.28 as G-AUTL, struck off register 9.36
328	G-CAJT	19. 6.28	Western Canada Airways Ltd.; burned out near High River, Alberta 23.10.28
329	G-CAPG	11. 7.28	Ontario Provincial Government Air Service, withdrawn from use 2.41
330	G-AUHW	9.10.28	"Canberra", Australian Aerial Services Ltd., to Holden Air Transport, Ltd., New Guinea 1932, struck building and burned out, Rabaul, New Guinea 2.11.34
331	G-AAAN	8.10.28	"Geraldine", Associated Newspapers Ltd., later N.F.S. Ltd. "Leone", to Australia 1.32 as VH-UQJ, scrapped 9.36
333	G-AUJC	8. 1.29	"Diana"; to W. R. Carpenter Ltd., N.G., crashed at Salamaua, New Guinea 23.10.35
334	G-AUJB	19. 1.29	"Apollo"; to Stephens Aviation Ltd., N.G. 9.37, crashed at Mubo, New Guinea 9.5.38
335	G-AAEV	15. 5.29	"Youth of Britain", Alan Cobham Aviation Co. Ltd., crashed at Broken Hill 19.1.30
336	G-CARD	—	London Air Transport Ltd., London, Ontario
DHC.141	CF-OAK	14. 6.32	Ontario Provincial Government Air Service, crashed in Gander Lake, N. Ontario 23.5.36

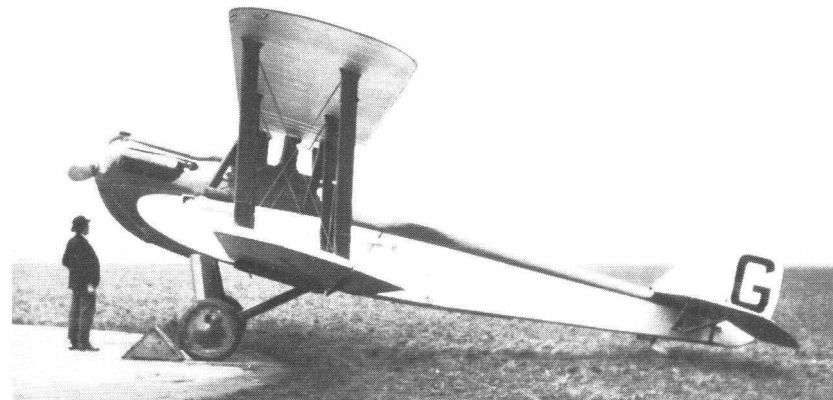


The first D.H.65 Hound, c/n 250, with direct drive Napier Lion VIII. (P. T. Capon Photo.)

De Havilland D.H.65 Hound

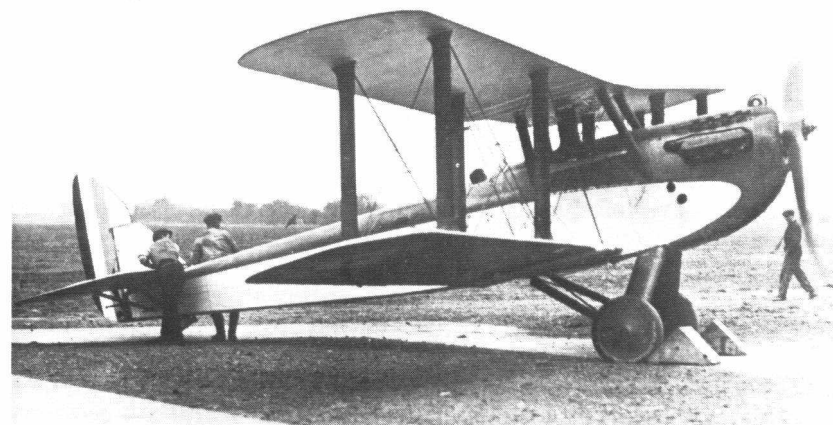
The reservation on January 15, 1926 of civil registrations *G-EBNJ* and *NK* for two D.H.65 aircraft in the respective names of the de Havilland Aircraft Co. Ltd. and its chairman A. S. Butler, passed practically unnoticed. In actual fact it marked the company's determination to go ahead with a high performance military aircraft to show what could be done if designers were not hampered by Air Ministry specifications. They intended to outclass, in dramatic manner, all contemporary 'Christmas Tree' military prototypes, and as the D.H.65s were private ventures, test flying had to be done in civil guise.

By March 1926 construction was well under way, and all the lessons of the previous six years went into making the D.H.65—type name Hound—into the fastest two seat aeroplane in the world at that time. The fuselage was of standard de Havilland plywood construction with spruce longerons and cross pieces, and the two bay, wooden, fabric covered mainplanes were almost equal in span and chord to those of the D.H.9A. Ailerons were fitted to the lower mainplane only. Two fuel tanks of 74 and 52 gallons capacity were carried in the front fuselage, fuel being pumped to a slim 20 gallon gravity tank in the centre section. The undercarriage was almost identical with those being built for the D.H.9J modernisation programme, using oleo damped rubber-in-compression shock legs with rear radius rods. A rudder of traditional D.H. shape and a 530 h.p. Napier Lion VIII direct drive, 12 cylinder, broad arrow, watercooled engine with frontal radiator, served to heighten resemblance to the D.H.9A.



The Hound *G-EBNJ* after installation of the underslung radiator, a feature of the D.H.65A. (P. T. Capon)

The Hound made its first flight at Stag Lane in the hands of H. S. Broad on November 17, 1926, as an unarmed prototype bearing the first of the allotted civil markings. The designed military load of 509 lb. included a D.H. low drag gun ring on the rear cockpit but this had not yet been fitted. The Lion's centre row of cylinders—always a headache for designers seeking sleek cowlings and clean entry—was faired neatly into a false decking terminating in the pilot's windscreen. Insistence on clean lines and strict attention to detail made the Hound a thoroughbred which did 160 m.p.h. and carried extraordinary loads considerably faster than contemporary fighters.



The D.H.65A with 540 h.p. Napier Lion XA geared engine, faired-in load under the lower wing root and larger rudder.



The D.H.65J, c/n 332, with 520 h.p. Bristol Jupiter VIII F. (Imperial War Museum Photo MH.5423.)

The Air Ministry agreed to test the Hound if the geared 540 h.p. Lion XA were fitted and made an engine available, but before the trials parts of the unfinished second aircraft were embodied, notably the metal spar wings and faired interplane struts. Nose lines were improved by fitting an underslung retractable radiator. *G-EBNJ* first flew with the new engine as the D.H.65A on February 27, 1927 and was flown to the A. & A.E.E., Martlesham Heath by Hubert Broad on March 19th to compete for the D.H.9A replacement contract to Specification 12/26.

Although its performance far outstripped those of its undistinguished rivals, it was unacceptable because equipment had to be carried externally on account of the narrow fuselage and its clean lines imparted too long a landing float for small aerodromes. There were also slight directional problems for when the aircraft appeared at the Hendon R.A.F. Display on July 2, 1927 the original rudder had been replaced by one of larger area. For many years the de Havilland company regarded the rejection of the Hound and the loss of yet another lucrative contract as its greatest disappointment in the military field and a setback it could not readily forget.

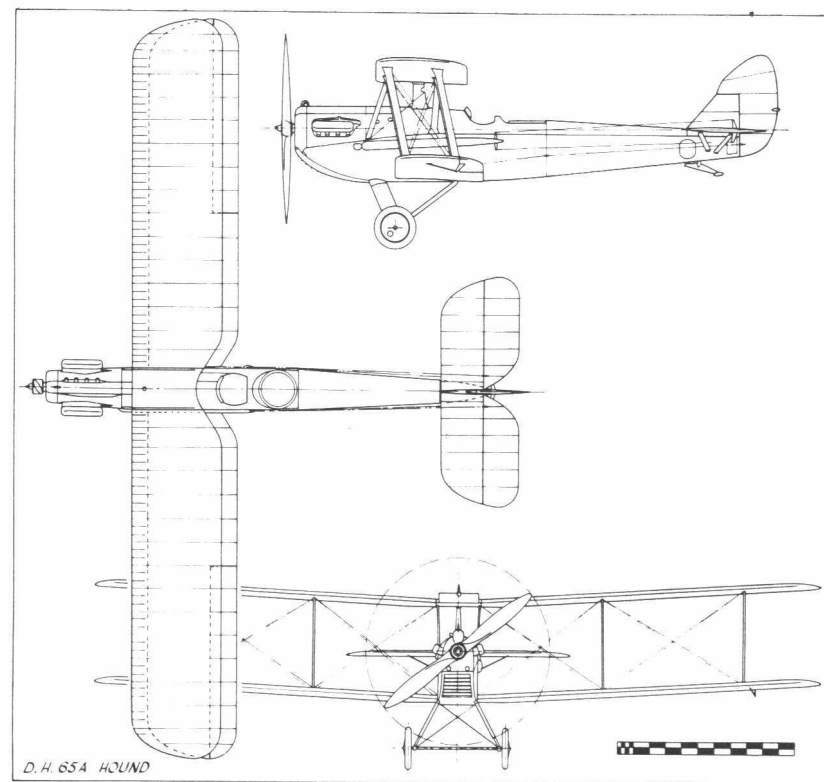
The D.H.65A remained at Martlesham until Easter 1928 and then returned to the makers to be prepared for a series of attempts on the world's speed-with-load records. The rear cockpit was covered in and the 'load', which consisted of a number of lead bars, was attached to the lower wing and covered with fabric. The Napier Lion XA was then replaced by a Lion XI, which, although of similar power, had the type test certificate necessary for the record attempt. The record flights were made successfully by H. S. Broad on April 26, 1928 but on the following day he flew the Hound over

five circuits of a course between Stag Lane and Reading in poor visibility to improve on his figures and to set up the following records—

- (a) 100 km with 1,000 kg load at 162.284 m.p.h.
 - (b) 500 km with 1,000 kg load
 - (c) 500 km with 500 kg load
- } at 158.656 m.p.h.

Afterwards the Hound received the serial number *J9127* and with the Lion XA re-fitted, returned to Martlesham where trials were resumed on September 11, 1928, but ten days later routine inspection found the plywood of the rear fuselage in poor condition. Repair involved dismantling the aircraft and this evidently brought its career to an end.

Consequent upon the original Hound's failure to secure a production contract, an entirely redesigned version was built to Australian requirements and bore the same external relationship to the earlier machine as did the Stag to the D.H.9A. The Lion gave place to a 520 h.p. Bristol Jupiter VIII F radial, differential ailerons were fitted to all four wings and the wide track, divided undercarriage had front, in place of rear, radius rods. The front fuselage was built of steel tubing with wire bracing but



the after portion was of plywood as before. Wing spars were duralumin tubes of oval section with wooden ribs and steel drag and interplane struts, a system tried out beforehand on an experimental set of D.H.51 wings. Although bearing little resemblance to its predecessors, the new machine was named Hound II under the designation D.H.65J but throughout the whole of its short career was devoid of all markings other than wing roundels and rudder stripes. After bare hull flight trials at Stag Lane, the D.H.65J went to Martlesham where, with the exhaust collector ring removed but equipped with front Vickers gun, rear Lewis gun on the D.H. low drag gun ring and racks for 450 lb. of bombs under the lower mainplane, official tests were conducted between June and November 1928. Other features included dual control in the rear cockpit—which also extended into the rear fuselage to form a prone bombing position—and alternative provision for a single heavy bomb or torpedo between the undercarriage legs.

SPECIFICATION AND DATA

Manufacturers: The de Havilland Aircraft Co. Ltd., Stag Lane Aerodrome, Edgware, Middlesex

Power Plants: (D.H.65) One 530 h.p. Napier Lion VIII
(D.H.65A) One 540 h.p. Napier Lion XA
One 540 h.p. Napier Lion XI
(D.H.65J) One 520 h.p. Bristol Jupiter VIII

Dimensions, Weights and Performances:

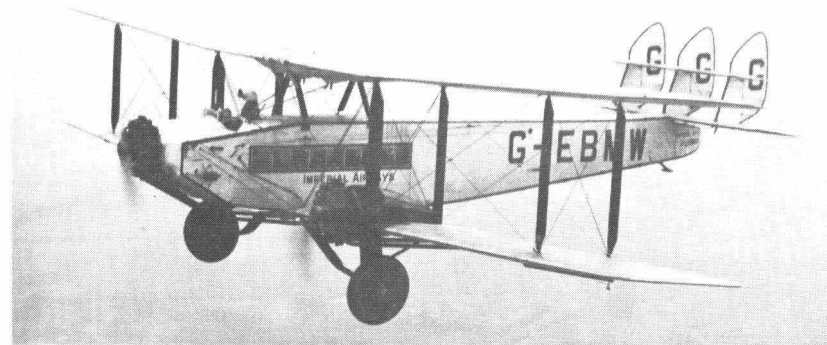
	D.H.65	D.H.65A	D.H.65J
Span	45 ft. 0 in.	45 ft. 0 in.	45 ft. 0 in.
Length	31 ft. 3 in.	31 ft. 0 in.	33 ft. 3 in.
Height	11 ft. 6 in.	11 ft. 6 in.	—
Wing area	461½ sq. ft.	461½ sq. ft.	461½ sq. ft.
Tare weight	—	2,981 lb.*	3,065 lb.
All-up weight	4,603 lb.	4,934 lb.*	4,979 lb.
Maximum speed**	—	161 m.p.h.	125 m.p.h.
Initial climb	—	1,490 ft./min.	1,170 ft./min.
Ceiling	—	25,600 ft.	20,400 ft.
Range	—	—	1,000 miles

* 3,285 lb. and 4,640 lb. with Lion XA

** At 5,000 ft.

Production:

	Constructor's No. and Registration	Type	Remarks
250	G-EBNJ	D.H.65	Converted to D.H.65A in 1927, first flown in military marks 16.7.28 as J9127
251	G-EBNK	D.H.65	Not completed, registration cancelled 1.28
332	Nil	D.H.65J	To Australian Government Specification, first flown at Stag Lane during week ending 3.6.28

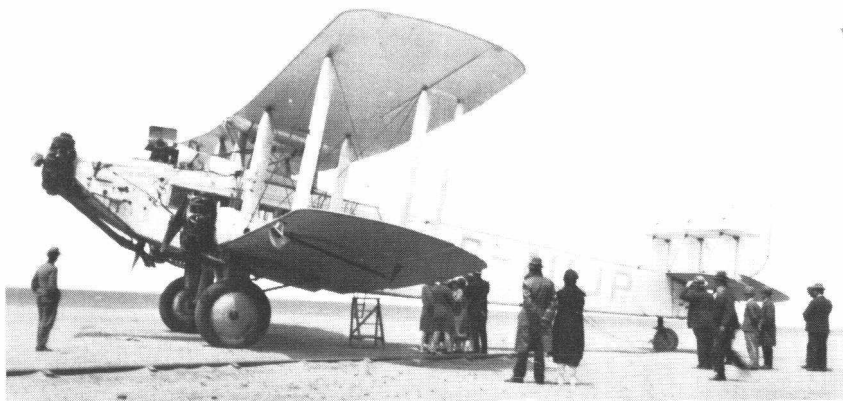


The prototype D.H.66 Hercules G-EBMW, c/n 236, on an early test flight without ailerons on the top mainplane. ('Flight' Photo 4166A.)

De Havilland D.H.66 Hercules

The R.A.F.'s desert air mail service between Cairo and Baghdad, inaugurated in 1921 with D.H.9As, continued in operation for over six years but in 1925 an agreement was reached with the Air Ministry for the route to be taken over by Imperial Airways Ltd. They were to receive a maximum annual subsidy of £87,000, increased to £93,600 before the service began, for five years and open a regular fortnightly service from Cairo to Karachi. A fleet of new transport aircraft was to be built for the purpose and Imperial Airways drew up a specification which stipulated multi engines to minimise the risk of forced landings in the desert and ample reserves of power for tropical operation. The de Havilland design for a large two bay biplane powered by three 420 h.p. Bristol Jupiter VI radials was approved and a contract placed for five aircraft. Although mainplane construction followed standard practice with twin wooden box spars and spruce ribs, the difficulty of obtaining suitable spruce in sufficient lengths and the risk of deterioration under tropical conditions, led to the abandonment of the traditional D.H. plywood covered fuselage. That of the new aircraft, designated D.H.66, was of tubular steel construction with two large plywood boxes forming the cabin and a rear baggage compartment of 155 cu. ft. capacity, suspended inside. Two pilots sat in an open cockpit in the nose and the spacious cabin—with the usual D.H. sliding windows—accommodated wireless operator, seven passengers and up to 465 cu. ft. of mail. A truly massive biplane tail unit with three fins and rudders imparted cathedral-like dignity.

While the prototype was still under construction, a type name was chosen through the medium of a competition run in June 1926 by the *Meccano Magazine* and won by E. F. Hope-Jones of Eton College who suggested Hercules. All the de Havilland employees turned out on Sep-



G-AUJP "City of Adelaide", second West Australian Airways D.H.66 with enclosed cockpit and tailwheel, at Forrest, W.A., in November 1929. (C. D. Pratt Collection—AHSA Vic.-CDP.57.)

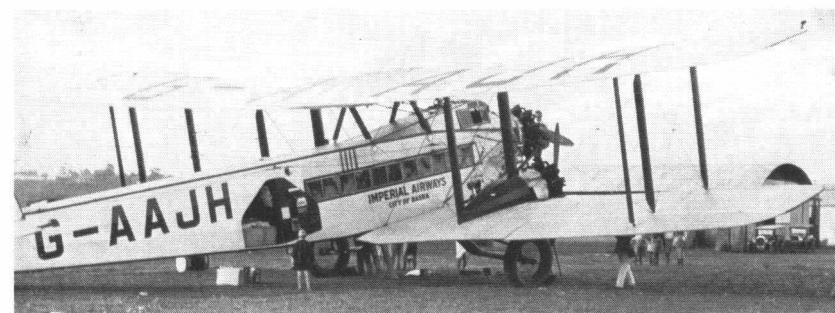
tember 30th to witness the first flight of the prototype, *G-EBMW*, piloted by H. S. Broad. There was room for improvement in lateral control and the machine went back into the works to have ailerons fitted to all four wings. After acceptance trials at Croydon by Imperial Airways superintendent H. G. Brackley and some crew training, it left for Heliopolis, Cairo on December 20th piloted by Capt. F. D. Travers. The transfer of the desert air mail service from military to civil control was marked by an historic flight by the Air Minister, Sir Samuel Hoare who, with Lady Maud Hoare, left Croydon on December 27th in the second Hercules *MX* piloted by Capt. F. L. Barnard. On January 10, two days after its arrival at Delhi the aircraft was named "City of Delhi" by Lady Irwin, wife of the Viceroy of India. It was the prototype which operated the first commercial flight on the route which left Basra on January 7th, arriving in Cairo two days later. The machine was named "City of Cairo" by King Fuad on March 2nd. *G-EBMW* also flew the inaugural eastbound service which left Cairo on January 12th and terminated at Basra as no through service to Karachi was possible until Persian Government agreement was obtained two years later. The delivery of the "City of Teheran" at Heliopolis in March 1927 completed the Hercules contract and the fleet settled down to build up a reputation for trouble free service under trying conditions.

In the following year West Australian Airways Ltd. successfully tendered for a new passenger and mail service between Perth and Adelaide with express train connection to Melbourne. They received an annual mail subsidy of £70,000 and selected the D.H.66 as the obvious aircraft to carry passengers over country every bit as difficult as that served by Imperial Airways in the Middle East. Four more of the Hercules type were therefore built at Stag Lane but with modifications to suit Australian requirements. A cabin top with sliding windows was built over the pilots'

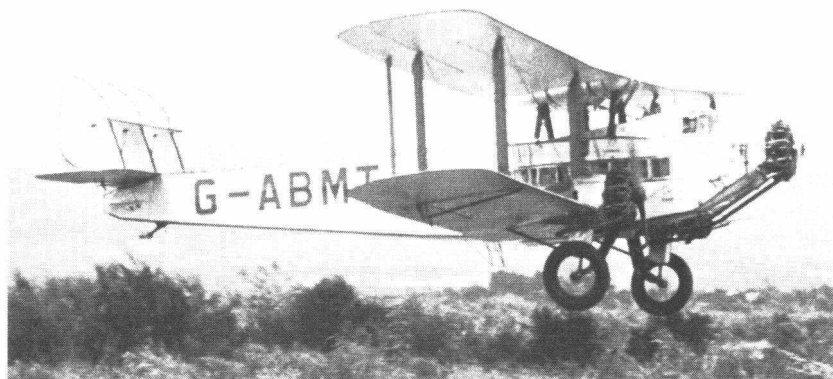
cockpit, seating accommodation was provided for 14 passengers in addition to mail, and a tailwheel was fitted which failed to survive rough usage and was eventually removed. Acceptance trials were conducted by H. G. Brackley at Stag Lane in March 1929 after which the four aircraft were shipped to Perth, W.A. and erected at Maylands Aerodrome in readiness for the first eastbound service, flown jointly by "City of Adelaide" and "City of Perth" which arrived in Adelaide on May 29th after covering the 1,450 miles in 14 hours' flying time, carrying a combined total of 21 passengers.

When the Imperial Airways route was extended to Delhi in 1929, a sixth D.H.66 was ordered and commissioned at Heliopolis in June 1929 with the name "City of Basra". The pilots' cabin fitted to this and all D.H.66s built in 1929, was later added to those built in 1926. In the following September "City of Jerusalem" stalled on approach to Jask at night and was destroyed by fire with the loss of Capt. Woodbridge and two passengers, an accident which led to a replacement order. This, the eleventh and final D.H.66, was ferried from Stag Lane to Croydon on January 27, 1930 and commissioned as the "City of Karachi" at Heliopolis a week later. The fleet was not destined to remain long at full strength and a month later "City of Teheran" (Capt. Foy) eastbound from Gaza at night, returned with engine trouble, forced landed and broke up without casualties. As the type was now out of production, an approach was made to West Australian Airways Ltd. which led to the sale of their fourth Hercules to Imperial Airways Ltd. as the "City of Jodhpur".

In the following year two experimental through air mail services were flown for the first time between Croydon and Melbourne. The Australian mail was picked up at Karachi by Capt. R. P. Mollard and H. W. C. Alger, who left for Darwin in "City of Cairo" on April 13, 1931 but the veteran prototype ran short of fuel in appalling weather and was wrecked in a forced landing in rock strewn grassland ten miles from Koepang on April 19th. The mail was retrieved by Kingsford Smith and flown to Darwin in the Fokker monoplane "Southern Cross" which also returned



The Imperial Airways D.H.66 "City of Basra", c/n 393, at Nairobi on December 17, 1931 during the survey flight to the Cape with Christmas mail. The later type of lengthened pilots' cabin is fitted.



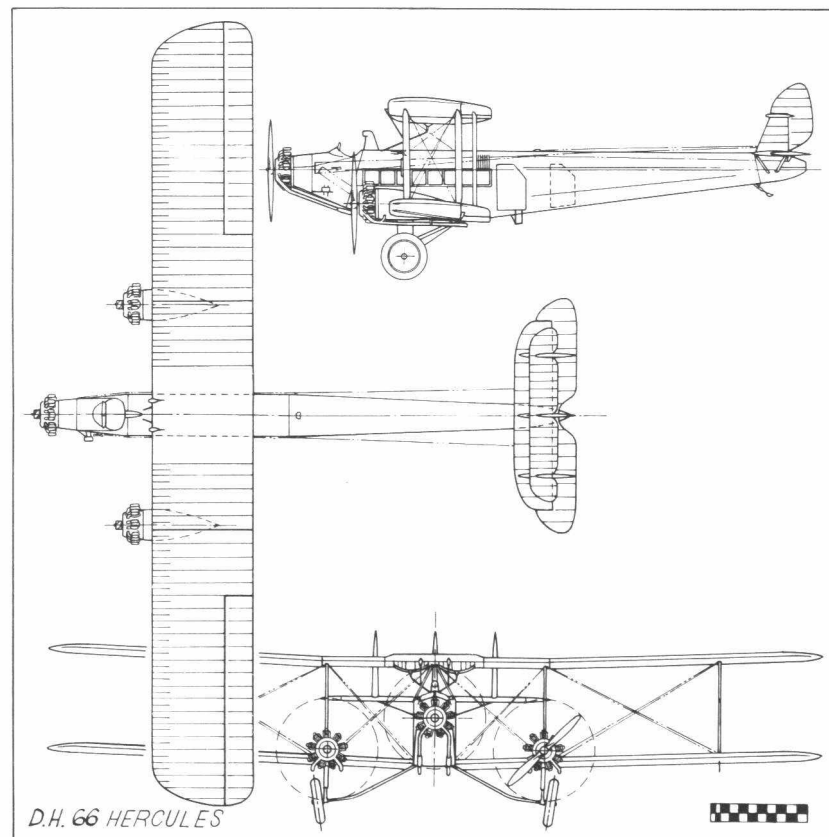
The D.H.66 Hercules *G-ABMT* landing at Cape Town airport during Sir Alan Cobham's inaugural Air Display on December 1, 1932.

to hand over the first through Australia–England mail to Capt. Alger in “City of Karachi” at Akyab on May 3rd. The same Hercules, Capt. E. S. Alcock, flew the second eastbound mail from Karachi to Akyab on May 5–6th but a replacement for the lost prototype was needed urgently and the Australian Department of Civil Aviation granted special permission for West Australian Airways Ltd. to dispose of their third aircraft, providing it was flown to Darwin by a W.A. Airways pilot. It left Maylands, Perth on May 15th under the command of Capt. J. F. Nicholson who handed it over to Capt. R. P. Mollard of Imperial Airways at Darwin on the 18th. The dual purpose delivery/air mail flight continued the next morning under the Australian marks *VH-UJQ*, Karachi being reached on



The elderly Hercules *G-EBMX* in service with the South African Air Force as 262 in 1935. (S.A.A.F.)

the 27th. After overhaul it was christened “City of Cape Town”, a name which foreshadowed a southward extension of the Empire Air Route to South Africa. The survey flight for this was made by H. G. Brackley and Capt. Alger in *G-AARY*, the name of which was repainted for the occasion in Afrikaans as “Stad van Karachi”. Their arrival at Wingfield Airport, Cape Town on December 21, 1931 paved the way for regular services and the Hercules became well known in South Africa and in the following October Sir Alan Cobham acquired “City of Cape Town” as the ‘giant airliner’ for his itinerant air pageant. It became the mainstay of an otherwise unhappy tour, daily leading a formation of three Avro Tutors and a Cierva C.19 Mk. IV Autogiro and giving free flights at the expense of the *Cape Times*. Coincidentally, on October 23, 1932, one of the remaining Australian Hercules was giving 5s. joyrides at the Aerial Pageant at Maylands Aerodrome, Perth but when West Australian Airways Ltd. was taken over by Australian National Airways in 1936, both D.H.66s were sold to Stephens Aviation Ltd. in New Guinea to fly the



Lae-Wau ferry until destroyed in the early days of the war with Japan.

In 1934 Imperial Airways' *G-AAJH* "City of Basra" had pioneered the aerial anti-locust campaign in Rhodesia where *G-ABCP* "City of Jodhpur" was damaged beyond repair in the following year when taking off from soft ground. Two others were withdrawn from service but *G-AAJH*, *G-ABMT* and *G-EBMX* were sold to the South African Air Force for a mere £775 each and delivered to the S.A.A.F. base at Swartkop in April, July and November 1934 respectively. They were then serialised 260-262 and in June-July 1935 the erstwhile *G-AAJH*, now 260, returned briefly to pest control duties when it dropped several hundred pounds of arsenical dust on locust swarms at Vryheid and Gollel. In the early days of the Second World War they flew military courier services to South African Forces in other parts of Africa but in September 1939 the ancient second production aircraft 262, once *G-EBMX*, was reduced to spares at Broken Hill to service the other two until they were withdrawn from use in 1943.

SPECIFICATION AND DATA

Manufacturers: The de Havilland Aircraft Co. Ltd., Stag Lane Aerodrome, Edgware, Middlesex

Power Plants: Three 420 h.p. Bristol Jupiter VI

Dimensions: Span 79 ft. 6 in. Length 55 ft. 6 in.
Height 18 ft. 3 in. Wing area 1,547 sq. ft.

Weights: Tare weight 9,060 lb. All-up weight 15,660 lb.

Performance: Maximum speed 128 m.p.h. Cruising speed 110 m.p.h.
Initial climb 765 ft./min. Ceiling 13,000 ft.

Production:

	Constructor's No. and Registration	C. of A. Issued	Remarks
236	<i>G-EBMW</i>	18.12.26	"City of Cairo"; crashed near Koepang 19.4.31
237	<i>G-EBMX</i>	23.12.26	"City of Delhi"; to the South African Air Force 11.34 as 262, scrapped at Broken Hill 9.39
238	<i>G-EBMY</i>	17.12.26	"City of Baghdad"; withdrawn from use 12.35
239	<i>G-EBMZ</i>	21. 2.27	"City of Jerusalem"; crashed at Jask 6.9.29
240	<i>G-EBNA</i>	7. 3.27	"City of Teheran"; crashed at Gaza 14.2.30
344	<i>G-AUJO</i>	30. 4.29	"City of Perth"; later <i>VH-UJO</i> , crashed between Salamaua and Wau, N.G. 6.2.41
345	<i>G-AUJP</i>	30. 4.29	"City of Adelaide"; later <i>VH-UJP</i> , destroyed by enemy action in New Guinea 1942
346	<i>G-AUJQ</i>	30. 4.29	To Imperial Airways 6.31 as <i>G-ABMT</i> "City of Cape Town"; to Cobham 10.32; returned to Imperial Airways 3.33; to the South African Air Force 7.34 as 261, scrapped in 1943
347	<i>G-AUJR</i>	30. 4.29	To Imperial Airways 6.31 as <i>G-ABCP</i> "City of Jodhpur", crashed in swamp near Lake Salisbury, Uganda, 23.11.35
393	<i>G-AAJH</i>	26.10.29	"City of Basra"; to the South African Air Force 4.34 as 260, scrapped in 1943
703	<i>G-AARY</i>	25. 1.30	"City of Karachi"; withdrawn from use 12.35



K2602, second of the two Gloster A.S.31 Survey biplanes.

De Havilland D.H.67

Up to 1926 converted D.H.9s were used by the Aircraft Operating Co. Ltd. for the majority of its overseas aerial surveys and with them, vast experience was gained in the development of specialised flying and photographic techniques. With these weary war surplus aircraft rapidly approaching the end of their useful lives, the company drew up a specification for a replacement machine which would be ideally suited to its requirements. Twin engined reliability with good single engine performance was essential if forced landings were to be avoided in difficult country; the airframe had to be of rugged metal construction, not easily damaged and requiring little maintenance, even in the tropics, far from organised workshop facilities; and there must also be an above average field of vision for air and survey crews alike.

De Havillands were approached and the resultant design study was given the type number D.H.67, and was, in effect, a scaled down, all metal version of the D.H.66 Hercules powered by two Bristol Jupiter VI engines in the familiar wing nacelles. In front elevation and plan form the D.H.67 layout was remarkably like that of the prototype D.H.66 even to the same type of bulged centre section fuel tank and ailerons only on the bottom mainplane. The important differences were tandem open cockpits for pilot and navigator with a prone photographer's position and floor mounted camera beneath them, a central cabin with three circular port-holes for oblique photography, and a reversion to the single D.H. type fin and rudder. Attachments were provided for an interchangeable seaplane undercarriage using 24 ft. Short twin metal floats.

By November 1927 the scheme had progressed as far as a revised layout known as D.H.67B, with increased span. Greater gap at the fuselage resulted in anhedral on those portions of the lower wing inboard of the engine. Improved performance at the same all-up weight of 7,000 lb. was achieved by fitting Bristol Jupiter VIIIs and directional control was

improved by re-introducing the D.H.66 biplane tail but with only two vertical surfaces. Pilot and navigator were rehoused in a side by side open cockpit under the leading edge of the centre section and the front camera operator now had an open cockpit in front of and below them, giving a stepped nose. In the light of D.H.66 experience, ailerons were fitted on all four wings, which were also made to fold.

Preoccupation with Moth, Hercules and other contracts resulted in construction being delegated to the Gloster Aircraft Co. Ltd. which completed all the detail designs, changed all the dimensions, used its own constructional methods and fitted developed engines to produce an aircraft designated the Gloster A.S.31 which only superficially resembled the original design. The A.S.31 was nearer to the D.H.67 than to the D.H.67B, having a single fin and rudder (although of typical Gloster outline) and ailerons on the lower mainplane only. It was of fabric covered metal construction throughout, employing high tensile steel wing spars, duralumin ribs and a fuselage of steel tubing. The crew occupied a single open cockpit in the nose, reached via a door in the front bulkhead of a roomy cabin and the aircraft was readily adaptable for survey, bombing, ambulance or seaplane work.

Two prototypes were built, one of which, *G-AADO*, was equipped with three camera positions to the order of the Aircraft Operating Co. Ltd. and first flown at Brockworth in June 1929. The other, *K2602*, was supplied to the Air Ministry and exhibited in skeleton form at the Olympia Aero Show of July 1929, afterwards being completed and delivered on November 19, 1931 to the R.A.E. Farnborough for wireless telegraphy experiments. De Havilland's chairman, Alan S. Butler, accompanied by Mrs. Butler and a cameraman, delivered the Aircraft Operating Company's A.S.31 to Cape Town by air, leaving Heston on March 20, 1930. Later it was flown to the scene of survey operations at Bulawayo by Maj. Cochrane-Patrick and in the course of the next year surveyed 63,000 sq. miles of Northern Rhodesia with conspicuous success. In May 1935 at the completion of a number of similar surveys in central Africa, the A.S.31 was sold to the South African Air Force with which it was still in service in 1942.

SPECIFICATION AND DATA

Manufacturers: The Gloster Aircraft Co. Ltd., Hucclecote, Gloucestershire

Power Plants: (D.H.67) Two 450 h.p. Bristol Jupiter VI
(D.H.67B) Two 480 h.p. Bristol Jupiter VIII
(A.S.31) Two 525 h.p. Bristol Jupiter XI

Production:

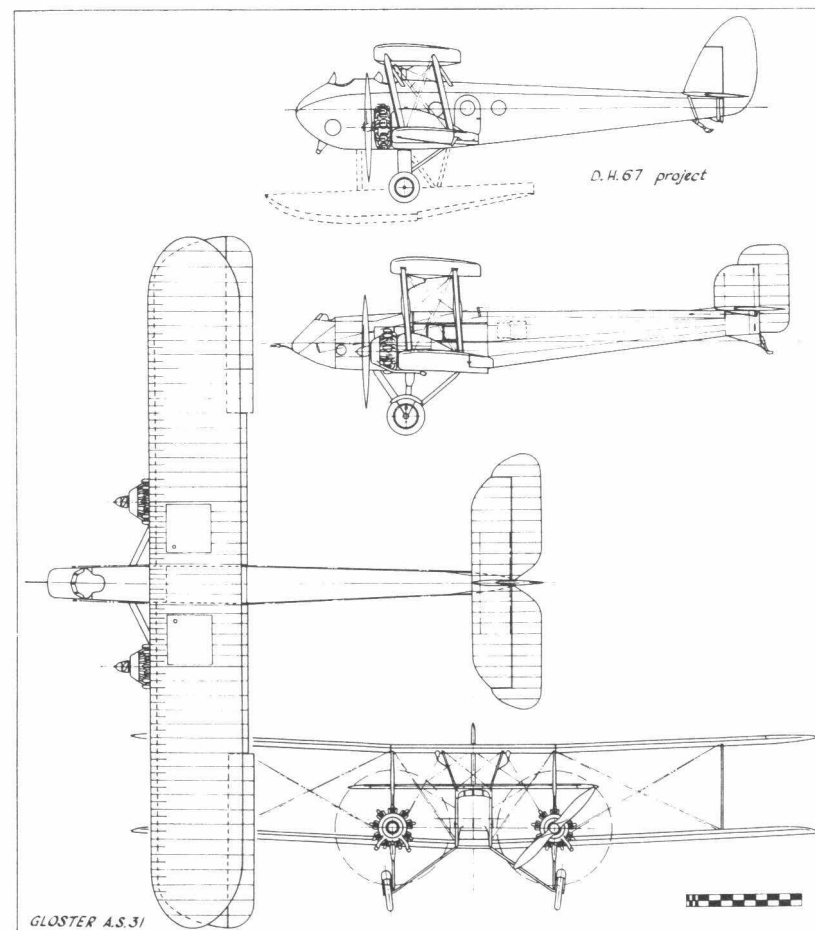
Constructor's No. and Registration	C. of A. Issued	Remarks
Nil <i>G-AADO</i>	30.1.30	Sold to the S.A.A.F. 5.33 as 250, scrapped at Waterkloof 12.42
Nil <i>K2602</i>	Nil	Delivered to R.A.E., Farnborough for W/T experiments 19.11.31, last used 17.9.36

Dimensions, Weights and Performances:

	D.H.67	D.H.67B	A.S.31
Span	56 ft. 6 in.	60 ft. 0 in.	61 ft. 0 in.
Length	40 ft. 6 in.*	40 ft. 6 in.*	48 ft. 6 in.
Height	13 ft. 0 in.	14 ft. 0 in.	18 ft. 9 in.
Wing area	830 sq. ft.	880 sq. ft.	1,025 sq. ft.
Tare weight	—	—	5,615 lb.
All-up weight	7,000 lb.	7,000 lb.	8,570 lb.
Maximum speed	—	—	131 m.p.h.
Cruising speed	—	—	110 m.p.h.
Initial climb	—	—	—
Ceiling	—	—	23,200 ft.**
Range	—	—	495 miles

* Seaplane 43 ft. 0 in.

** One engine 10,400 ft.





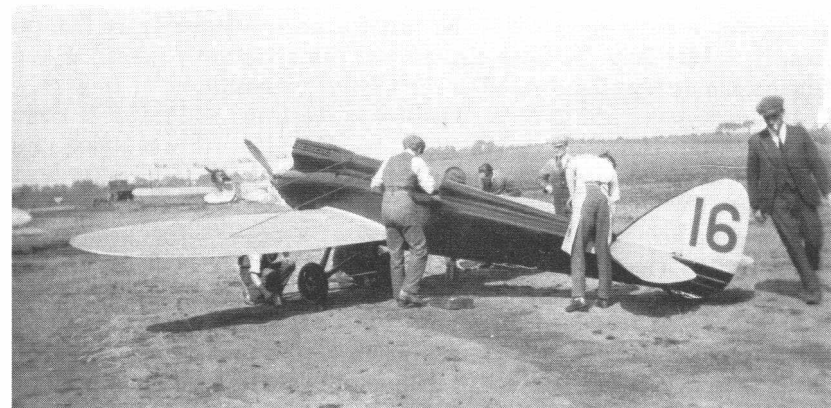
G-EBQU, c/n 323, first of the D.H.71 Tiger Moth monoplanes, under the nose of the Beardmore Inflexible at the R.A.F. Display, Hendon on June 30, 1928.
(Topical Press Photo.)

De Havilland D.H.71 Tiger Moth

Two diminutive D.H.71 airframes, constructed in considerable secrecy at Stag Lane in 1927, were intended for high speed research at reasonable cost and at the same time to act as flying testbeds for Maj. Halford's prototype Cirrus-replacement engines, then nearing completion. Fuselage design closely followed that of the standard Moth, with stressed plywood covering, but the cockpit was tailored literally to fit test pilot H. S. Broad, making it necessary for the fuselage sides to slope outwards toward the top decking in order to accommodate his shoulders. Entry to the cockpit was only possible by dividing the adjacent decking along the centre line and allowing each half to hinge downwards. With the pilot in and the decking closed, the lines of the engine and of the pilot's head were continued smoothly down to the fin by means of a long tapering dorsal fillet.

The thin section, fabric covered mainplanes were built in two halves with oval tips, I section spars and wooden ribs. Aileron and elevator gaps were closed by sponge rubber strips and bracing was by means of duplicated streamlined wires, those under the wing also holding the undercarriage rigidly in place and forming the 'axle'. The undercarriage legs were plain struts, all the bungee shock absorber cord being buried inside the thickness of the wheel to cut down drag. The whole aircraft was a masterpiece of purposeful ingenuity. The fuel tank of 16 $\frac{3}{4}$ gallons capacity conformed to the lines of the fuselage just ahead of the pilot, engine oil was cooled by finning the crankcase and making it fit snugly into the under fuselage, the rear end of which faired into a thickening at the bottom of the rudder.

The name Tiger Moth was allotted and both aircraft were entered for the King's Cup Race at Hucknall on July 30, 1927, the first, *G-EBQU* (No. 16) by Lady Wakefield and the second, *G-EBRV* (No. 17) by Lord Wakefield, the pilots being C. D. Barnard and H. S. Broad respectively. To check handling characteristics 'QU' was completed with an 85 h.p. A.D.C. Cirrus II engine and Broad made the first flight at Stag Lane on June 24th. It was then re-engined with Halford's prototype engine, now known as the Gipsy and delivering some 135 h.p. Although the C. of A. was issued on the day before the race 'QU' was withdrawn to be tuned for record breaking purposes. The second D.H.71, Cirrus II powered throughout its life, first flew on July 28th but was plagued by bumps during the race. The uneven ground jolted the throttle half shut and almost doubled the take off run while those in the air caused involuntary hand movements



The first D.H.71, with Gipsy engine and short span wing, being groomed at Stag Lane for its attack on the closed circuit record, August 1927.



H. S. Broad in the second D.H.71 (Cirrus II) at the start of the King's Cup Race at Hucknall on July 30, 1927.

which made level flight impossible. Although his speed as far as Spittlegate was 4 m.p.h. up on handicap at 166 m.p.h., he returned to Hucknall and retired.

A second set of mainplanes with reduced span of 19 ft. was fitted to the first aircraft, enabling Broad to set up a world's record on August 24th for the 100 km closed circuit in Light Aeroplane Category Class III at an average speed of 186.47 m.p.h. On the 29th an attempt was made on the world's altitude record in the same category and in 17 minutes 'QU reached 19,191 ft., above which Broad could not go without oxygen even though the machine was still climbing at over 1,000 ft./min. Several light aeroplanes were exhibited in the New Types Park at the Hendon R.A.F. Display of June 30, 1928, one of which was the D.H.71 *G-EBQU* in immaculate yellow finish. Unfortunately the rough surface of the aerodrome ruled out all possibility of taking off for a flying demonstration which would have shown it to be faster than the majority of fighters present. A year later the same aircraft was again statically exhibited, this time on the de Havilland stand at the Olympia Aero Show of July 1929. In 1930 it was shipped to F. K. Bardsley in Australia and flown at Point Cook by Maj. Hereward de Havilland but David Smith was killed in it on September 17th while practising at Mascot for the following Saturday's air racing. The engine cut on take off and the Tiger Moth crashed into a street from a height of 150 ft.

The second Tiger Moth 'RV' was withdrawn from active flying in 1928 and the engineless airframe was hoisted into the rafters of the flight shed at Stag Lane. It remained there until 1933 when, mounted on top of a notice board outside the new Hatfield factory, it formed an advertisement for that year's King's Cup Race. It then returned to its customary position



Maj. Hereward de Havilland running up the D.H.71 *G-EBQU* at the R.A.A.F. Point Cook, Victoria, after its arrival in Australia in 1930.

in the roof, this time at Hatfield, until destroyed by a Junkers Ju 88 which bombed the factory on October 3, 1940.

SPECIFICATION AND DATA

Manufacturers: The de Havilland Aircraft Co. Ltd., Stag Lane Aerodrome, Edgware, Middlesex

Power Plants: One 85 h.p. A.D.C. Cirrus II
One 135 h.p. de Havilland Gipsy experimental

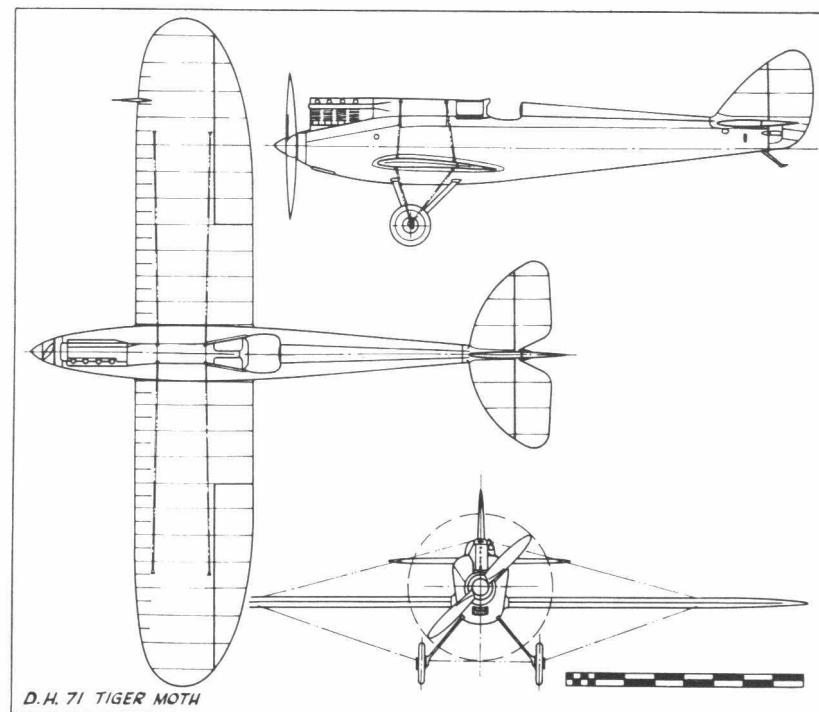
Dimensions: Span (normal) 22 ft. 6 in. (special) 19 ft. 0 in.
Length 18 ft. 7 in. Height 7 ft. 0 in.
Wing area (normal) 76½ sq. ft. (special) 62½ sq. ft.

Weights: (normal) Tare weight 618 lb. All-up weight 905 lb.

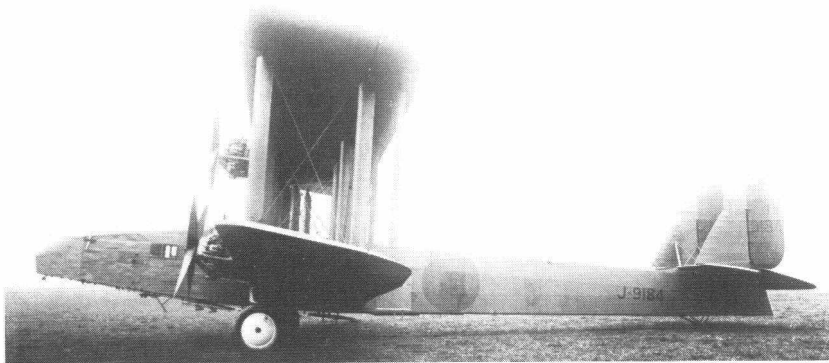
Performance: (normal) Maximum speed 166 m.p.h. Landing speed 60 m.p.h.
(special) Maximum speed 193 m.p.h.

Production:

	Constructor's No. and Registration	C. of A. Issued	Remarks
323	<i>G-EBQU</i>	29.7.27	Gipsy engine, to Australia 1930 as <i>VH-UNH</i> , crashed at Mascot 17.9.30
324	<i>G-EBRV</i>	28.7.27	Cirrus II engine, destroyed by enemy action at Hatfield 3.10.40



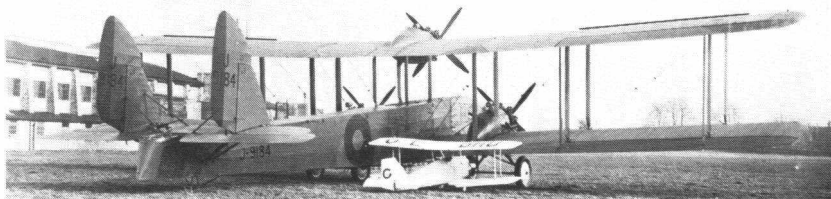
D.H. 71 TIGER MOTH



The D.H.72 night bomber J9184, c/n 392.

De Havilland D.H.72

The origins of this aircraft are obscure but it is evident that the Air Ministry was impressed by the clockwork regularity with which the D.H.66s were operating over long distances and saw in it a similarity to the Vickers Virginia replacement envisaged by their B.22/27 night bomber specification. An order was therefore placed for one prototype aircraft to meet it and in 1928 work began on an enlarged version of the D.H.66 having mainplanes of duralumin instead of wood. de Havillands were as yet unfamiliar with the techniques of light alloy construction and only slow progress was made in the experimental department, further delay being caused when the Ministry specified a gun position in the nose, necessitating the transfer of the centre engine to the leading edge of the top wing. The unfinished airframe was so long a part of Stag Lane's internal decorations that the original Bristol Jupiter VIs were changed progressively for later marks until the Jupiter XFS was reached. In the course of time the Ministry was persuaded to move the D.H.72 to Brockworth where it was completed under an existing arrangement whereby the Gloster Aircraft Co. Ltd. undertook development of de Havilland's military designs following W. G. Carter's appointment as



The D.H.72 photographed at Brockworth alongside the little Gloster Gannet single seat light biplane.

Gloster's chief designer.

In final form the D.H.72 had a monoplane tail unit with twin fins and rudders which was almost identical in appearance with that of the projected D.H.67B which Glosters had previously studied. Rows of external bomb racks were fitted under the centre part of the long, low slung fuselage, and each outboard engine nacelle was mounted above its own two wheeled undercarriage.

The machine was completed and flown in 1931 and is known to have visited R.A.E., Farnborough on November 19–20th of that year, the month in which it went to the A. & A.E.E., Martlesham Heath to be flown in competition with the Boulton and Paul P.32 which was very similar in layout and also powered by three Jupiters.

SPECIFICATION AND DATA

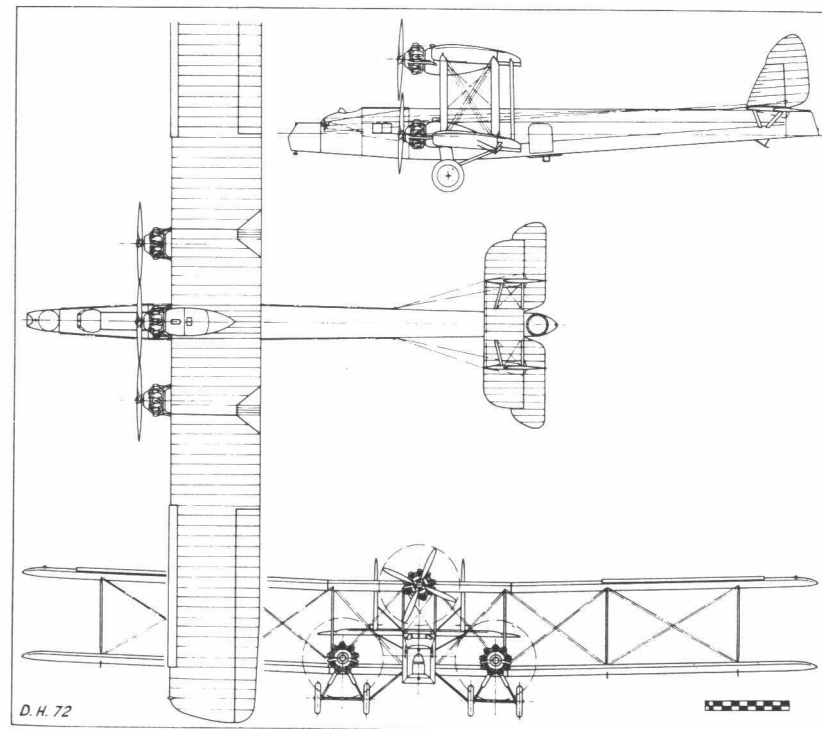
Manufacturers: Begun by the de Havilland Aircraft Co. Ltd., Stag Lane Aerodrome, Edgware, Middlesex; completed by the Gloster Aircraft Co. Ltd., Hucclecote, Gloucestershire

Power Plants: Three 595 h.p. Bristol Jupiter XFS

Dimensions: Span 95 ft. 0 in. Wing area 1,930 sq. ft.

Weights: All-up weight 21,462 lb.

Production: Prototype only J9184, c/n 392





G-EBVV, the prototype Hawk Moth, c/n 327, with 198 h.p. de Havilland Ghost engine.
(*'Flight'* Photo 6746.)

De Havilland D.H.75 Hawk Moth

During 1928 Maj. Halford reversed the birth process of the original Cirrus I by bench testing a V-8 aircooled engine comprising two modern Gipsy Is mated on a common crankcase. It was, in short, an engine similar in layout to the old wartime Renault but giving over twice the power at a very much lower weight. The new power unit, named the D.H. Ghost, was developed for the D.H.75 Hawk Moth four seat cabin monoplane which had been designed for light transport or taxi work overseas. Fabric covered, composite construction that had proved so ruggedly serviceable under extremes of temperature in the D.H.66 was again used for the Hawk Moth, which combined a welded steel fuselage and tail unit with a wooden wing. The roomy cabin had two paired seats for pilot and three passengers with provision for dual control and luggage space in the rear. It was fitted as usual with generous Triplex sliding windows and each pair of seats had its own door, but only on the starboard side. Fuel tanks of 35 gallons capacity were housed in the wing roots, the mainplane being built in two halves and shoulder mounted. It was braced by two streamlined tubular steel struts, the front one also forming part of the pyramid structure of the undercarriage from which it could be released by a spring loaded pin for wing folding.

H. S. Broad flew the prototype for the first time at Stag Lane on December 7, 1928 but it was underpowered and the performance was disappointing. Several more Hawk Moths were then built with mainplanes of increased span and 16 in. greater chord. The first two had 240 h.p. Armstrong Siddeley Lynx geared engines which gave them a much more useful performance. At this stage the type was known for a short time as the Moth Six in order to emphasise its relationship to its smaller brother

the Puss Moth then coming on the market with the short-lived name Moth Three. Designated D.H.75A, the first two Lynx powered machines had a considerable history. One was exhibited with a wing folded, but without markings, at the Olympia Aero Show of 1929 after which the first one, *G-AAFW*, was demonstrated in Canada in December 1929 and afterwards flown extensively by P. C. Garrett of de Havilland Aircraft of Canada Ltd. Trials with this machine on skis and with the sister aircraft *'FX'* on Short floats at Rochester, led in 1930 to Contract 1907 for three Lynx engined Hawk Moths with interchangeable undercarriages for the Canadian Government. First of these, *G-CYVD*, temporarily re-registered *CF-CCA* and based at Ottawa for personal use by the Controller of Civil Aviation, was the former *G-AAFW*, but having no doors on the port side, was not permitted to fly as a seaplane. The others, *G-CYVL* and *'VM'*, intended for Government civil operations, had doors on both



One of the D.H.75A Hawk Moths, c/n 708, with Armstrong Siddeley Lynx VIA supplied to the R.C.A.F. in 1930.



The first Lynx powered Hawk Moth, *G-AAFW*, on skis in Canada in December 1929.



The Australian demonstrator, *VH-UNW*, inscribed 'de Havilland Hawk Moth' arriving over Sydney on June 3, 1930 piloted by Amy Johnson.

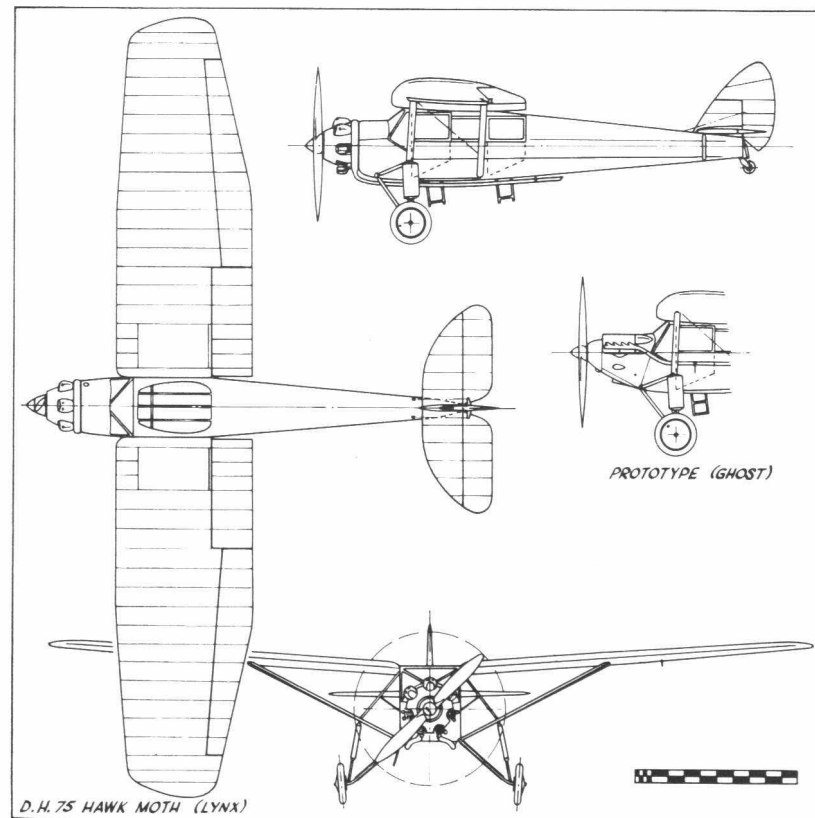
sides and Hamilton adjustable pitch metal airscrews as well as strengthened wing root fittings and cabin roof structures. They were cleared for float operation after tests at Rockcliffe by D.H.C. test pilot Leigh Capreol on October 4, 1930 but payload was very limited and the aircraft flew thereafter only on wheels or skis. Several undercarriage failures occurred and after 'VL' crashed during acceptance tests as a landplane at Longueil, Quebec in 1931, the others were flown only with prior permission until withdrawn from use a year or so later and converted into snowmobiles at Camp Borden.

Australian markets were also aimed at and 'FX' went to de Havilland Aircraft Pty. Ltd. as demonstrator in 1930. On June 3rd of that year Amy Johnson flew in it from Brisbane to Sydney after her Moth "Jason" had come to grief. Hart Aircraft Services of Melbourne used it on charter until Tasmanian Airways bought it in February 1934 but after serious damage in a forced landing at Brighton, Tasmania on January 10, 1935, it was rebuilt with a Wright Whirlwind J-5. It then flew with a series of owners until January 1943 when an Armstrong Siddeley Cheetah IX was fitted by the final operator, Connellan Airways Ltd., Alice Springs.



The D.H. 75B, c/n 394, with 300 h.p. Wright Whirlwind R-975 radial. ('Flight' Photo 8451.)

Competition from American types such as the Ryan B-1 Brougham, killed the Hawk Moth within a year. In an unsuccessful attempt to recapture the market, one machine, designated D.H. 75B, was fitted in March 1929 with the 300 h.p. Wright Whirlwind radial, power plant of the Ryans which were filtering into Canada, Australia and even England. Total Hawk Moth production was eight, one of which, *VH-UOY*, was flown by Ron Adair, proprietor of Aircraft Pty. Ltd., on daily services to Too-woomba, Maryborough and in 1931 to the goldmining centre of Cracow. The fifth production aircraft *G-AAUZ*, certificated in June 1930, was H.R.H. Prince George's entry for the King's Cup race in which it came seventh, piloted from Hanworth to Cramlington and back by F/Lt. E. H. Fielden at an average speed of 126.2 m.p.h. In 1932 'UZ acquired the traditional red fuselage of Air Taxis Ltd., the charter firm which Capt. W. L. Hope opened at Stag Lane when the de Havilland Hire Service closed down, and gave invaluable service until stored in 1936 and sold abroad two years later.



SPECIFICATION AND DATA

Manufacturer: The de Havilland Aircraft Co. Ltd., Stag Lane Aerodrome, Edgware, Middlesex.

Power Plants: (D.H.75) One 198 h.p. de Havilland Ghost
 (D.H.75A) One 240 h.p. Armstrong Siddeley Lynx VIA
 One 300 h.p. Wright Whirlwind J-5
 One 350 h.p. Armstrong Siddeley Cheetah IX
 (D.H.75B) One 300 h.p. Wright Whirlwind R-975

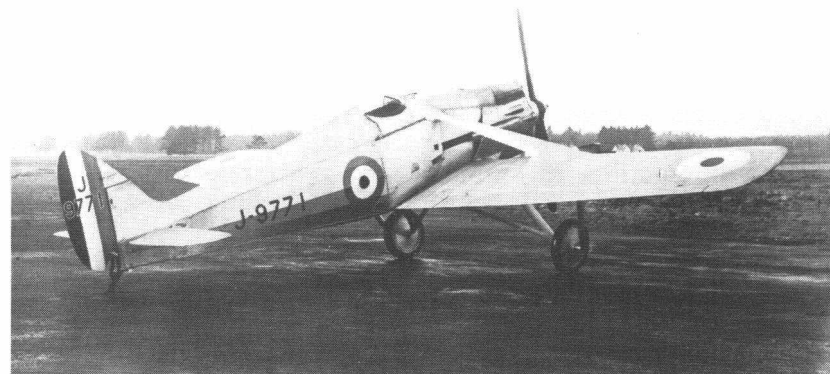
Dimensions, Weights and Performances:

	D.H.75	D.H.75A		D.H.75B
		Landplane	Seaplane	
Span . . .	44 ft. 0 in.	47 ft. 0 in.	47 ft. 0 in.	47 ft. 0 in.
Length . . .	29 ft. 1 in.	28 ft. 10 in.	32 ft. 1 in.	28 ft. 8 in.
Height . . .	9 ft. 4 in.	—	11 ft. 4 in.	—
Wing area . . .	277 sq. ft.	334 sq. ft.	334 sq. ft.	334 sq. ft.
Tare weight . . .	2,000 lb.	2,380 lb.	2,653 lb.	2,387 lb.
All-up weight . . .	3,500 lb.	3,650 lb.	3,800 lb.	3,870 lb.
Maximum speed . . .	—	127 m.p.h.	123 m.p.h.	136 m.p.h.
Cruising speed . . .	100 m.p.h.	105 m.p.h.	100 m.p.h.	109 m.p.h.
Initial climb . . .	—	710 ft./min.	620 ft./min.	760 ft./min.
Ceiling . . .	—	14,500 ft.	12,000 ft.	15,000 ft.
Range . . .	—	560 miles	540 miles	560 miles

Production:

Constructor's No. and Registration	C. of A. Issued	Remarks
327 <i>G-EBVV</i>	Nil	D.H.75, first flown 7.12.28, scrapped in 1930
343 <i>G-AAFW</i>	7.11.29	To Controller of Civil Aviation, Ottawa 11.29 as <i>CF-CCA</i> ; re-registered to same operator 7.30 as <i>911</i> ; to R.C.A.F. 1931 as <i>G-CYVD</i> , struck off charge at Camp Borden 8.10.35
348 <i>G-AAFX</i>	22. 2.30	First flown by G. de Havilland 17.7.29, and as seaplane by Broad at Rochester 15.10.29; to Australia 12.30 as <i>VH-UNW</i> ; to Connellan Airways Ltd. 1.43; scrapped at Alice Springs 5.51
394 unreg.	Nil	D.H.75B, first flown by Broad 9.3.29; flown until 10.6.30 and dismantled
395 unreg.	Nil	Untraced, believed not built
705 <i>G-AAUZ</i>	26. 6.30	de Havilland Aircraft Co. Ltd.; to Air Taxis Ltd., Stag Lane 6.32; out of use and sold 1.36
706 <i>VH-UOY</i>	2. 7.30	To Aircraft Pty. Ltd., Brisbane; crashed at Archerfield Aerodrome, Brisbane 12.5.35
707 <i>G-CYVL</i>	Nil	On R.C.A.F. charge 19.12.30; crashed at Longueuil, Quebec 27.6.31; flew 18 hr. 30 min.
708 <i>G-CYVM</i>	Nil	On R.C.A.F. charge 9.11.30; struck off charge at Camp Borden 5.10.34; flew 58 hr. 50 min.
709 unreg.	Nil	Untraced, believed not built

Note: All D.H.75A with Lynx VIA unless otherwise stated.



The D.H.77 J9771, c/n 391, in its original form with Napier Rapier I engine. (Crown Copyright Reserved.)

De Havilland D.H.77

Air Ministry Specification F.20/27 was issued following a proposal made in 1927 to change fighter tactics and abolish standing patrols in favour of interception by a new class of fighter specially designed to take off and climb to combat height in minimum time. The new specification called for a short range, lightly loaded type, without radio and carrying only a minimum of other equipment, so that interceptors built to meet it were generally smaller and more compact than normal fighters. Orders were placed for a number of competition prototypes all of which were powered, in the manner of the time, by large diameter aircooled radial engines. They were not particularly successful and several firms built private venture entries using in-line engines. These included the Hawker Hornet which was ordered in quantity as the Fury, and de Havilland's unnamed D.H.77 monoplane.

The latter owed a great deal to the little D.H.71 Tiger Moth and had almost the same performance but was $2\frac{1}{2}$ times the weight and had three times the power. Furthermore its performance was almost identical with that of the contract winning Fury but on only 60% of the power. This remarkable achievement was due entirely to the firm's profound understanding of aerodynamic refinement as a means of saving power and so reducing fuel load. Outstandingly clean entry resulted from close collaboration between the airframe designer W. G. Carter and Maj. F. B. Halford who created a novel supercharged aircooled engine of low frontal area having four banks, each of four cylinders, driving two crankshafts geared together. Following an agreement signed in 1928, Halford engines of over 404.09 cu. in. cylinder capacity were built by D. Napier and Son Ltd. at

Acton, so that it was known first as the Napier H type and later as the Rapier I. It imparted slim lines to the nose of the D.H.77 which afforded superb forward view for the pilot and permitted the use of an efficient cooling system with low drag entry and exit ducts.

The fuselage was a box girder built of steel tubing and faired to oval section by fabric over wooden formers. Tubular steel struts formed a faired-in V on each side to brace the fabric covered semi-cantilever wing to the top longeron. Large span differential ailerons were fitted and a novel form of wide track undercarriage employed slim, fabric covered rubber-in-compression legs outside the wheels and clear of the slipstream. Good spin recovery characteristics were achieved by fitting an all-moving tail-plane without any fixed horizontal surface. The pilot sat above the wing with a commanding view in all directions, armament consisting of two Vickers guns under the cowlings on each side of the cockpit harmonised with a centrally mounted telescopic sight.

The D.H.77 was first flown at Stag Lane by H. S. Broad on July 11, 1929 and proved to have a top speed approaching 200 m.p.h. with a landing speed of 60 m.p.h. With full military load at 20,000 ft. it did 182 m.p.h. but the unladen maximum was 203 m.p.h., all on a mere 325 h.p. Broad carried on intensive development flying until he delivered it to Martlesham on December 12th, Geoffrey de Havilland having flown it on October 3rd and 4th. Broad flew it back on March 8, 1930 and the machine was then purchased by the Air Ministry and allocated serial *J9771*, and Martlesham trials were completed in September 1930. It was shown in the New Types Park at the Hendon R.A.F. Display of June 28, 1930 and afterwards gave a flying demonstration which included a simulated interception climb. At a later date it went to Brockworth for further flight trials by Gloster Aircraft Ltd. under the agreement mentioned in the

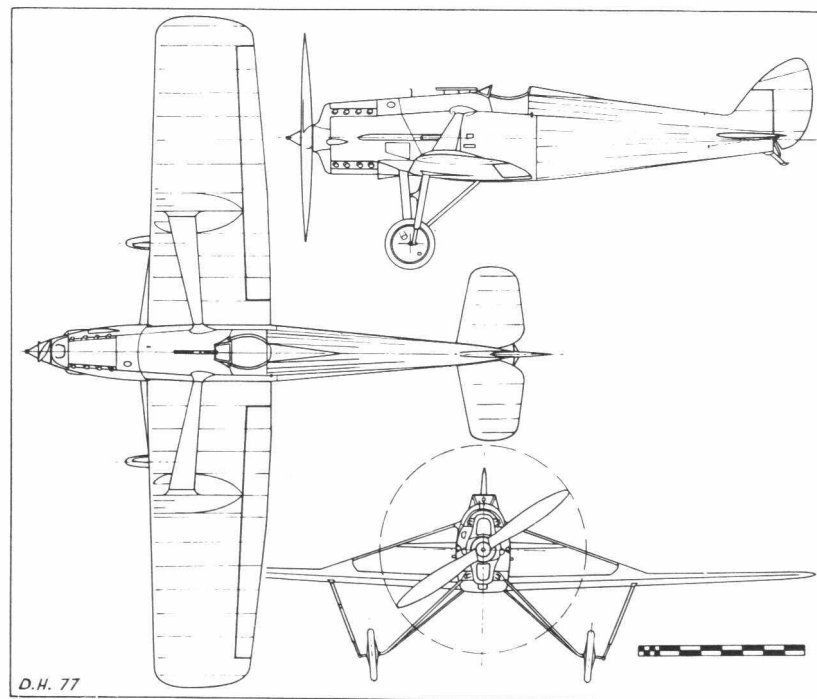


The D.H.77 in final condition with Napier Rapier II and semi-circular crash pylon.
(Crown Copyright reserved.)

chapter on the D.H.72. With armament removed it completed a 100 hours Rapier engine development programme until delivered to the R.A.E., Farnborough on December 8, 1932, for the trial installation of the Napier Rapier II in modified cowlings with external oil cooler and exhaust stacks. It also acquired oversize tyres and a crash guard in the form of a semi-circular steel tube above the windscreen—mute testimony to the Air Council's long years of distrust of the safety of low wing monoplanes when landing. Rapier development occupied 1933 and disposal followed the end of spinning tests in June 1934.

SPECIFICATION AND DATA

<i>Manufacturers:</i>	The de Havilland Aircraft Co. Ltd., Stag Lane Aerodrome, Edgware, Middlesex		
<i>Power Plants:</i>	One 300 h.p. Napier Halford H (later Rapier I) One 295 h.p. Napier Rapier II		
<i>Dimensions:</i>	Span 32 ft. 2 in.	Length 24 ft. 4½ in.	
	Height 8 ft. 0 in.	Wing area 163 sq. ft.	
<i>Weights:</i>	Tare weight 1,655 lb.	All-up weight 2,279 lb.	
<i>Performance:</i>	Maximum speed 204 m.p.h. at 10,000 ft. Initial climb 1,885 ft./min.		
<i>Production:</i>	Prototype only, <i>J9771</i> , c/n 391.		



D.H. 77



The R.A.F.'s D.H.80A Puss Moth K1824, c/n 2044, with the original type of rudder. ('Flight' Photo 9533.)

De Havilland D.H.80A Puss Moth

By the end of 1928 the Moth and its variants had created a flourishing private flying movement and as pilots ventured farther afield, they began to demand cabin comfort and an end to the need for heavy flying clothing. De Havillands met the demand by persuading the Gipsy II engine to run upside down so that the cylinder heads no longer lay in the pilot's line of vision, and installing it in a scaled down version of the Hawk Moth. The new aircraft was of traditional wooden construction throughout, the plywood covered fuselage accommodating the pilot in front, with a separate compartment for two side by side passengers on a bench type seat across the back of the cabin. As with the Hawk Moth, entry was by two doors on the starboard side. The strut braced, folding mainplane was built in two halves, shoulder mounted to cut down centre section drag, and with the main undercarriage shock absorber legs anchored to the front wing root fittings.

This aircraft, the D.H.80, had no type name but contemporary advertising called it the Moth Three, and at the same period, the Hawk Moth was known for a short time as the Moth Six. The D.H.80 flew for the first time at Stag Lane on September 9, 1929 under B conditions as *E-1*, but for once the designers had underestimated the effect of improved airflow over the new engine and centre section, and the machine was 7 m.p.h. up on estimated top speed. In spite of this encouraging start the D.H.80 did not go into production and the truncated fuselage of the dismantled prototype was later well known as Stag Lane's Gipsy test rig.

Experience with the D.H.60M had shown that success in overseas markets lay in metal construction and it was decided that the production version of the new monoplane should have a welded steel tube fuselage and carry the name Puss Moth under the designation D.H.80A. The partition between pilot and passengers was deleted and the two passengers sat in staggered tandem seats, the rear one running on rails for ease of

entry. Progressive development of the inverted Gipsy II culminated in the delivery of the first production engine, styled Gipsy III, on May 6, 1930 and although the power output remained unchanged, the Puss was almost 30 m.p.h. faster than the Gipsy II Moth. With such a clean design it was necessary to steepen the glide, and to this end the wide undercarriage shock absorber fairings could be rotated through 90 degrees to form air brakes.

The D.H.80A Puss Moths were allotted the 2000 block of constructor's numbers and remained in production at Stag Lane for just three years, almost 50% of total output being exported, mainly for regular passenger and mail services, taxi and survey work. Initial deliveries apart from those via the de Havilland companies in Australia, Canada, India and South Africa, were made to Aerofotos, Argentina; the Asahi newspaper in Osaka, Japan; the Chinese Government; the Bata Shoe Company, Czechoslovakia; King Feisal of Iraq and the Iraqi Air Force; the Zagreb Aero Club; Wilson Airways Ltd., Kenya; the Air Survey and Transport Co., N.Z.; the Archduke Antoine of Rumania; the Aerial Transport Co. of Siam Ltd.; the U.S. Naval and Military Attachés in London; and to private owners in Belgium, Germany, Holland, Italy, Portugal, Southern Rhodesia, Spain and Switzerland. The fourth production Puss Moth was shipped to de Havilland Aircraft of Canada Ltd., for evaluation. Registered *CF-AGO*, it made a trans-Canada return flight from Toronto to Vancouver, an effortless performance which proved the type well suited to Canadian conditions. It led to sufficient orders from the R.C.A.F. and civil operators for the company to establish a production line for the erection of Puss Moths from components made in England. *CF-AVC*, manufactured in 1935 and one of the oldest aircraft still flying in Canada, revisited its birthplace in 1960 on the 25th anniversary of its certification.

The British market eventually absorbed 143 Puss Moths but on October 13, 1930 *VH-UPC* piloted by Capt. Nesbit had crashed in Western Australia, the first of nine accidents which marred the early career of this



The unnamed D.H.80, c/n 396, forerunner of the Puss Moth, showing the flat sided wooden fuselage and pronounced dihedral. ('Flight' Photo 7803.)

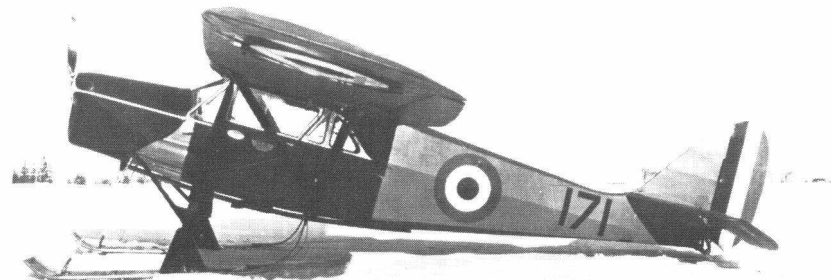
aeroplane. On May 5, 1931 Lt. Cdr. Glen Kidston and Capt. T. A. Gladstone were killed when *ZS-ACC* crashed near Van Reenen in the Drakensberg Mountains and another South African crew was lost at Sir Lowry's Pass on November 13th in the crash of *ZS-ACD*, the Puss Moth which R. F. Caspareuthus had delivered from Stag Lane to Germiston in the record flying time of 78 hours, October 5–13, 1930. In each case investigations on the spot revealed structural failure of the wings and it was at first thought that this might have some connection with the rudder flutter that de Havilland Aircraft of Canada Ltd. had experienced at high speeds with their original British built machine *CF-AGO* and three others, *CF-APE*, 'CCC' and 'IOL'. Then on May 21, 1932 the ski-equipped Puss Moth *G-CYUT* crashed at Ottawa and test pilot A. L. James, who survived, was able to describe the circumstances which led up to the failure of the port mainplane. Unfortunately Bruce Bossom and his two passengers were killed when *G-ABDH* crashed near Hindhead, Surrey on July 27th; R. Virtue, Capt. L. Holden (see page 261) and Dr. G. R. Hamilton lost their lives when *VH-UPM* of New England Airways crashed at Byron Bay,



VH-ABU, formerly with QANTAS as *VH-UPA*, showing the small rudder of the early Puss Moths and also the additional wing struts fitted in Australia by C. D. Pratt.

N.S.W. on September 18th; J. F. Fowler's *G-ABFU* was destroyed at Grenoble, France on October 29th; H. J. 'Bert' Hinkler was killed when crossing the Alps in *CF-APK* en route to Australia on January 7, 1933 and *HS-PAA* of the Aerial Transport Co. of Siam Ltd. dived into the ground between Khonkaen and Udorn on June 23rd.

Accident investigations recorded in Report R. & M. 1699 reveal that internal damage and failure at the tips was a common feature of all accidents. Intensive investigation by the National Physical Laboratory and the R.A.E., practical flying tests at Martlesham with the Air Ministry's own Puss Moth *K1824* and its eventual destruction in static tests at Farnborough in October 1932, revealed that in special circumstances only, when high speed was combined with turbulent weather conditions, wing failure could occur. Wing flutter tests with mass balanced ailerons were made by H. S. Broad in January 1931 using *G-AAVA* fitted with a



R.C.A.F. ski-equipped Puss Moth 171, commissioned in March 1931, was transferred to the Controller of Civil Aviation as *CF-CCI* in October 1932. (By courtesy of J. F. McNulty.)



The larger rudder fitted to the Puss Moth c/n 2188 used by the U.S. Embassy in London 1931–35. Originally to have been *G-ABNF*, it ended its days in British ownership as *G-ADOC*. ('Flight' Photo 10144.)

parachute seat and an emergency door, progressive modifications being made as considered necessary. These included the addition of a small stabilising stay tube connecting the forward wing strut with the rear wing root fitting, the substitution of the larger rudder developed for the seaplane variant but with mass balance and the fitting of more effective aileron mass balances. Final tests with the larger mass balanced rudder were made at the R.A.E. in December 1932 using de Havilland's experimental Puss Moth *E-8*, which had an 8 in. increase in sweepback on the mainplanes and a tailwheel. This aircraft reverted to standard for normal sale as *G-ACYT* in 1934, by which time the Puss Moth's early misfortunes had been forgotten, early promise had been fulfilled and it had become an outstanding aeroplane with some of the world's greatest flights to its credit.

CF-APK, the British built Puss Moth in which Hinkler met his death, became the first Canadian registered aeroplane to land in Great Britain under its own power when it touched down at Hanworth from Madrid on December 7, 1931 at the end of a solo trip that included the first non-stop flight from New York to Jamaica, the first British air crossing of the

Caribbean Sea, the first British flight from Jamaica to Venezuela and a 22 hour South Atlantic crossing from Natal to Bathurst. Hinkler ensured success by spending eight months in de Havilland's Toronto factory, supervising the erection of the aircraft and the installation of long range modifications of his own design. Sqn. Ldr. C. S. Wynne-Eaton's attempt to cross the North Atlantic in a similar long range single seater, *G-AAXI*, ended when the aircraft was destroyed by fire when taking off from Lester Field, Newfoundland on July 6, 1930 on a flight to the starting point at Harbour Grace.



J. A. Mollison's long range Puss Moth "The Hearts Content", c/n 2241, showing the revised cabin arrangements. ('Flight' Photo 12144.)

Early in 1931 Nevill Vintcent flew the sixth production aircraft *G-AAXI* to Ceylon which had not previously seen an aeroplane and on October 15, 1932 J. R. D. Tata flew the first air mails over the 1,330 mile Karachi-Bombay-Madras route in *VT-ADN*. At home the Prince of Wales bought *G-ABBS*, 'FV', 'NN' and 'RR' which were decorated in the red and blue of the Guards, and Amy Johnson was presented with *G-AAZV* "Jason II" in recognition of her solo Moth flight to Australia. Accompanied by C. S. Humphreys she used it for a rapid flight to Tokyo in 8 days 22 hours 35 minutes, leaving Lympne on July 26, 1931, reaching Moscow the first day and arriving in the Japanese capital on August 6th. The third production machine, *G-AAVB*, was fitted temporarily with Short floats, enabling it to be flown 1,040 miles nonstop from the Welsh Harp, Hendon to the Stockholm Aero Show by Col. the Master of Sempill in 12 hours on September 4, 1930. He returned via Norway and Scotland on the 22nd and later toured the entire British coast. Senor Carlos Bleck, who had flown a Cirrus Moth to West Africa, repeated the performance in the 100th production Puss Moth, covering 11,500 miles in the course of a return trip from Lisbon to Loanda early in 1931. His route crossed that of Mrs. Wilson and S. F. Mostert, at that time engaged on a flight from Kenya to England via West Africa and the Canary Islands in the first of three Wilson Airways Puss Moths, *VP-KAH*. Their flying time was 80

hours 40 minutes. Carl Nauer was less fortunate in that area and disappeared off the mouth of the Congo River in *CH-326* on August 6, 1933 while attempting a Cape Town-Europe record.

In the U.S.A. Frenchman H. A. Darren and two friends flew from Newark Airport to San Francisco in 1934 in *G-ABEL* which belonged originally to Lady Hay Drummond Hay. With a Gipsy Major it crossed the Rockies at 12,000 ft. with ease with three up and luggage and completed the tour via the Great Lakes in 50 hours flying time. Later the same year the Master of Sempill made a leisurely trip from England to Australia in his personal *G-ABJU* to attend the Centenary celebrations.

The first Puss Moth flight to Australia was made by F. R. Matthews who left Croydon in *G-ABDW* on September 16, 1930 and reached Darwin in a leisurely 4 weeks 4 days. Together with C. D. Pratt's *VH-ABU*, this aircraft was still used at Sydney in 1961 by Marshall Airways Ltd. as *VH-UQB* and flew for many years with locally devised strengthening in the form of an additional pair of wing struts. In 1973, 43 years after F. R. Matthews flew it out of Croydon, it was shipped back to Scotland, eventually to fly again with the Strathallan Collection.

Quite the most remarkable flights over this route were made by C. J. Melrose in an Australian registered Puss Moth *VH-UQO*. After flying 8,000 miles round Australia in the record time of 5 days 11 hours in August 1934, he flew it from Darwin to Croydon in 8 days 9 hours in order to compete in the MacRobertson Race to Melbourne. Leaving Mildenhall on October 20th, he averaged 103 m.p.h. to come third in the handicap section. The Cape record also suffered at the hands of Puss Moth pilots, first with Caspareuthus and again when Peggy Salaman and Gordon Store left Lympne in *G-ABEH* "Good Hope" on October 31, 1931 to lower the record to 6 days 6 hours 40 minutes.

Jim and Amy Mollison were star performers on Puss Moths. The former left Lympne in a special single seat, long range version, *G-ABKG*, on March 24, 1932 and flew via the Sahara and the west coast of Africa to reach the Cape in 4 days 17 hours 19 minutes. "The Hearts Content", *G-ABXY*, was then specially built for him with an enormous 160 gallon fuel tank in the cabin which gave a 3,600 mile range. Behind the tank lay the pilot's seat, access to which was by a small door at the rear. On August 18, 1932 he took off from Portmarnock Strand, Dublin and made the first solo east-west Atlantic crossing, landing at Pennfield Ridge, New Brunswick 31 hours 20 minutes later. "Desert Cloud", *G-ACAB* was then prepared for Amy Johnson and fitted with one of the first of the new 130 h.p. Gipsy Major engines. It lowered not only Mollison's Cape record by 10 hours 26 minutes but also broke that for the homeward journey. Mollison, again in 'XY, later became the first man to fly from England to South America, the first to make a solo east-west crossing of the South Atlantic and the first to cross both the North and South Atlantic Oceans, when he arrived at Port Natal in Brazil, 3 days 10 hours 8 minutes out from Lympne on February 9, 1933. By 1935 the Puss Moth had had its day as a long distance type and H. F.



W. D. Macpherson's slotted and flapped competition Puss Moth. ('The Aeroplane' Photo.)

Broadbent's round-Australia record of 3 days 9 hours 50 minutes, May 16-19, 1935 was probably its last.

G-ABMD was specially fitted with a 147 h.p. Gipsy Major h.c. engine and considerably modified by Airwork Ltd. of Heston for entry in the 1934 Warsaw International Touring Competition. Dr. Lachmann of Handley Page Ltd., James Martin of Martin-Baker Ltd. and Herr Hoeffner joined forces to design full span slots and wing flaps inboard of the ailerons which were rigged to droop 10 degrees in flight and in conjunction with a Fairey adjustable pitch airscrew, reduced the minimum flying speed to 35 m.p.h. Extra rear windows of the type fitted to "The Hearts Content" were also provided to improve rearward vision.

The standard Puss Moth was a stable, viceless aeroplane beloved of all pilots and several of those impressed for R.A.F. communications duties in the United Kingdom in 1939 had been with their original owners for over eight years. Many were used by the Air Transport Auxiliary for taxi work and a number reappeared after the war including *G-ABDF*, 'EH', 'KZ', 'RB' and 'YP' but in 1987 only a handful remained airworthy viz: *G-AAZP* owned by R. P. Williams who, together with H. Labouchere, flew the machine from Mildenhall to Melbourne in 1984 to commemorate the 50th anniversary of the MacRobertson Air Race; *G-ABLS* restored by C. C. Lovell at Southampton in 1968; *G-AEOA* which Dr. J. H. B. Urmston reconstructed at Botley in the same year; and a few others in Australia and the U.S.A..

In Canada *C-FPEI*, built in 1931 as 8877 for the U.S. Naval Air Attaché in London and well known in the '60s as the Tiger Club's *G-AHLO*, has been retired to the Rockliffe Museum.

SPECIFICATION AND DATA

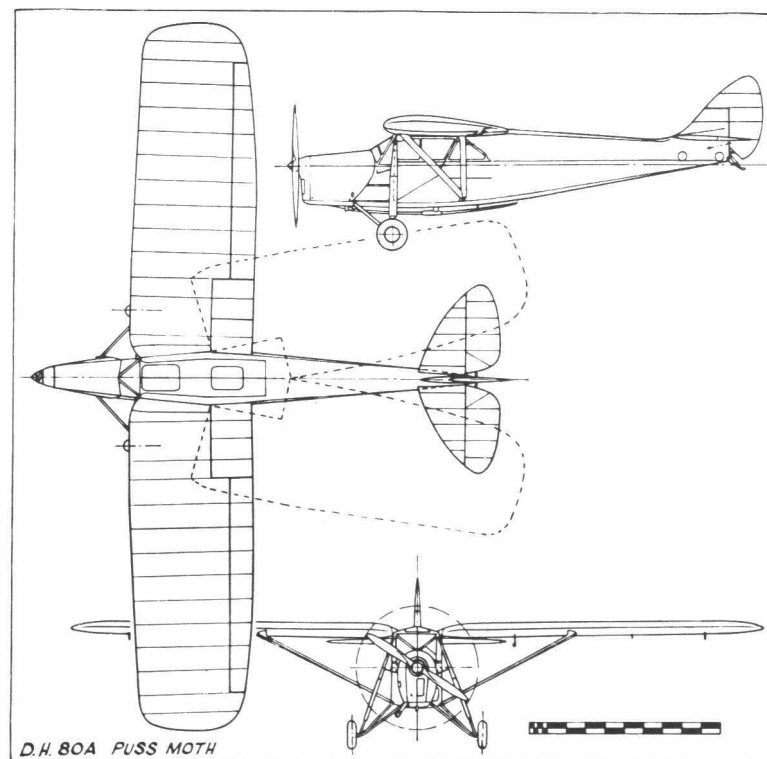
Manufacturers: The de Havilland Aircraft Co. Ltd., Stag Lane Aerodrome, Edgware, Middlesex. Some airframes assembled by de Havilland Aircraft of Canada Ltd., Downsview Airport, Toronto, Canada

Power Plants: One 120 h.p. de Havilland Gipsy III
One 130 h.p. de Havilland Gipsy Major
One 147 h.p. de Havilland Gipsy Major h.c.

	D.H.80*	D.H.80A	
		Landplane	Seaplane
Span . . .	36 ft. 9 in.	36 ft. 9 in.	36 ft. 9 in.
Length . . .	25 ft. 0 in.	25 ft. 0 in.	25 ft. 9 in.
Height . . .	7 ft. 0 in.	7 ft. 0 in.	8 ft. 3 in.
Wing area . . .	222 sq. ft.	222 sq. ft.	222 sq. ft.
Tare weight . . .	1,150 lb.	1,265 lb.**	1,355 lb.
All-up weight . . .	1,900 lb.	2,050 lb.	2,050 lb.
Maximum speed . . .	125 m.p.h.	128 m.p.h.	122 m.p.h.
Cruising speed . . .	105 m.p.h.	108 m.p.h.	95 m.p.h.
Initial climb . . .	660 ft./min.	610 ft./min.	600 ft./min.
Ceiling . . .	13,000 ft.	17,500 ft.	16,000 ft.
Range . . .	440 miles	300 miles	—

* And early production D.H.80A.

** Competition Puss Moth *G-ABMD* 1,243 lb.



Production:

(a) British

Constructor's Numbers	Aircraft markings
396	G-AAHZ (D.H.80 prototype)
2001-2025	G-AATC, 'VA, 'VB, CF-AGO, G-ABBH, G-AAXJ, 'XR, ZS-ACA, G-AAXS, 'XL, 'XM, 'XN, 'XT, 'XU, CF-AGQ, 'GS, 'GU, 'GT, 'GV, G-ABBS, VH-UPC, 'PA, 'PN, G-AAZI, 'ZY
2026-2050	G-AAXV- 'YA, VT-ABJ, G-AAVB, 'YK, 'YC- 'YE, G-AAFA, CF-AGW, G-ABCX, G-AAXO, 'ZM, 'ZN, KI824 to A.M. Contract 54344/30, G-AAZO, ZK-ABG, G-AAZP, CF-AGY, 'PK, CH-261
2051-2075	G-ABDW, VH-UPM, 'PJ, ZK-ABR, G-ABEC, VT-ABZ, G-ABDF, ZS-ACC, G-AARF, ZS-ACB, G-AAZS, CH-260, G-AAZT, MW-135, ZS-ACF, VH-USV, 'QK, D-1943, D-1944, G-ABDG, 'GZ, 'EH- 'EJ, 'EL
2076-2100	G-AAZU, 'ZV, Australia (2), VT-ACA, G-ABDH, D-1948, G-ABCR, VH-UPO, 'PQ, Australia (2), VH-UQL, 'QO, G-AAZW, G-ABDI, VT-ACB, 'CC, Australia (2), VT-ABG, OK-ATF, VT-ACD, 'CF, Portugal
2101-2125	G-AAZX, OK-ATG, ZS-ACE, G-ABGD, 'DM, 'DL, ZK-ACB, Argentina, G-ABEM, ZS-ACD, VT-ACI, Argentina, G-ABHB, I-FOGL, G-ABFY, 'GR, 'GS, VP-KAK, VT-ACH, G-ABGT, 'GX, 'FV, 'FU, VT-ABU, G-ABHC
2126-2150	ZS-ACG, G-ABIA, J-BAWA, Argentina (2), ZS-ACH, G-ABKZ, J-BAXA, G-ABIY, 'IN, 'IZ, 'IT, CH-270, G-ABIU, 'IH, 'IJ, UN-SAA, G-ABKD, 'JD, 'JO, D-2030, G-ABJB, YI-ABB, G-ABLB, 'LC
2151-2175	CH-271, ZS-ACP, VP-KAM, G-ABJV, 'JY, 'JU, 'KG, 'LD, 'LG, 'MC, 'NO, 'LP- 'LS, ZS-ACR, G-ABMS, 'LO, 'MD, ZS-ACS, G-ABNC, HS-PAA, G-ABMG, 'LX, 'MH, HS-PAB
2176-2200	G-ABMN, ZS-BBC, G-ABNS, HS-PAC, 'AD, ZS-ACT, CH-274, CH-276, UN-PAX, G-ABMP, I-FOLO, U.S.N.8877, G-ABNF, 'LY, 'NN, 'OF, CH-273, China (2), ZS-ACV, G-ABPB, ZS-ACU, VP-YAH, CV-AAI, G-ABNZ
2201-2226	G-ABOC, ZS-ADK, G-ABSA, ZK-ACX, VT-ABW, CH-303, G-ABPF, ZS-ACX, G-ABRR, OO-AMN, CH-326, export, G-ABSB, PH-MAG, Argentina, G-ABTD, 'SO, 'TV, 'UJ, 'UX, J-BBAA, J-BBBA, G-ABVT, Iraqi Air Force (3)
2227-2247	D-2235, G-ABVX, 'WA, India, E-8, G-ABWG, 'YP, 'YU, CR-MAE, G-ABWZ, Japan, G-ABXJ, Japan, G-ABYW, 'XY, Japan (4), G-ACBL, 'AB
2248 2260	Japan (11), G-ACFE, VP-KAZ

(b) Canadian

Constructor's Numbers	Aircraft markings
DHC.201-210	R.C.A.F. 169/R.C.M.P. 651, 170, 171/CF-CCI, 172/CF-CCF, 173, 174, 175/CF-CCL, 179, 177/CF-CCJ, 178/CF-CCK
DHC.211-220	176, 180/CF-CDN, 181/CF-CCM, G-CYUR, G-CYUS, CF-CCC, G-CYUU, G-CYUT, CF-IOL/CF-CDM, CF-APD
DHC.221-225	CF-APE, untraced, CF-AVA, CF-AVB, CF-AVC



The Swallow Moth, c/n 1992, in its D.H.81A configuration. (Alec Davis Photo.)

De Havilland D.H.81 Swallow Moth

During the six years of its development from the prototype of 1925 to the D.H.60T Trainer of 1931, the all-up weight of the Moth had gone up 50% and the power had doubled. It could no longer lay claim to being a 'light' aeroplane and to meet a demand for a return to the original concept of low cost sporting flying, the de Havilland company designed and built the D.H.81 Swallow Moth open cockpit two seater. It was an aerodynamically clean, low wing, cantilever monoplane, built on the simplest possible lines and prophetic of several D.H. types that were to follow. The plywood covered fuselage with its close cowled, special Halford-designed 80 h.p. Gipsy IV inverted four cylinder engine, was strikingly similar to the Moth Minor of six years later while the wing plan form and undercarriage were similar to those of the Leopard Moth of 1933.

The Swallow Moth was given a first 5 minute test flight by Geoffrey de Havilland at Stag Lane on August 21, 1931 in red priming dope without markings but after initial tests the fin area was reduced and modifications were made to the mainplane. At the same time a neat hinged cabin top was fitted and when the Swallow Moth flew in this configuration as the D.H.81A, the top speed went up from 117 to 129 m.p.h.—an astonishing performance on such low power.

de Havilland flew the D.H.81 on test for periods of 15 or 30 minutes at approximately weekly intervals until October 9, 1931 after which it was grounded for about a month and it is possible that this was for the incorporation of the D.H.81A modifications. He next flew it on November 2 and made his longest flight of 1 hr. 5 min. in the aircraft on November 5. Five other flights were made before the end of the year and in January 1932 the Swallow Moth was at last allotted the Class B marking E-7 with which it

first flew on January 29, a few days before its final flight of 10 minutes on February 3.

It was regrettable that this promising little aircraft arrived in the midst of a trade depression, which forced the manufacturers reluctantly to shelve it in order to concentrate on the production of existing types. Nevertheless, both airframe and engine provided useful data which bore fruit in the Moth Minor of 1938.

SPECIFICATION AND DATA

Manufacturers: The de Havilland Aircraft Co. Ltd., Stag Lane Aerodrome, Edgware, Middlesex

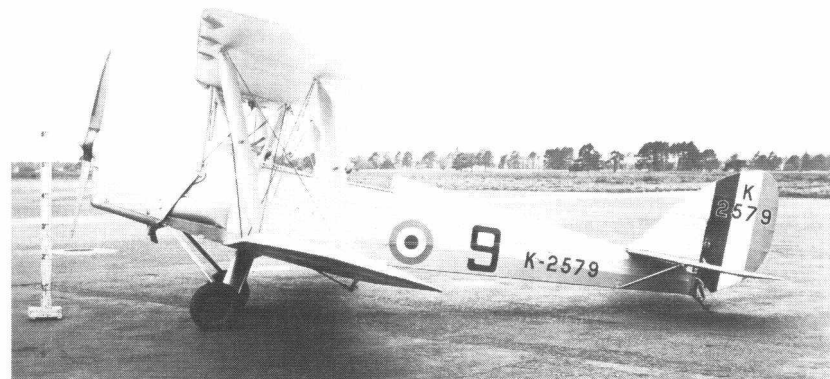
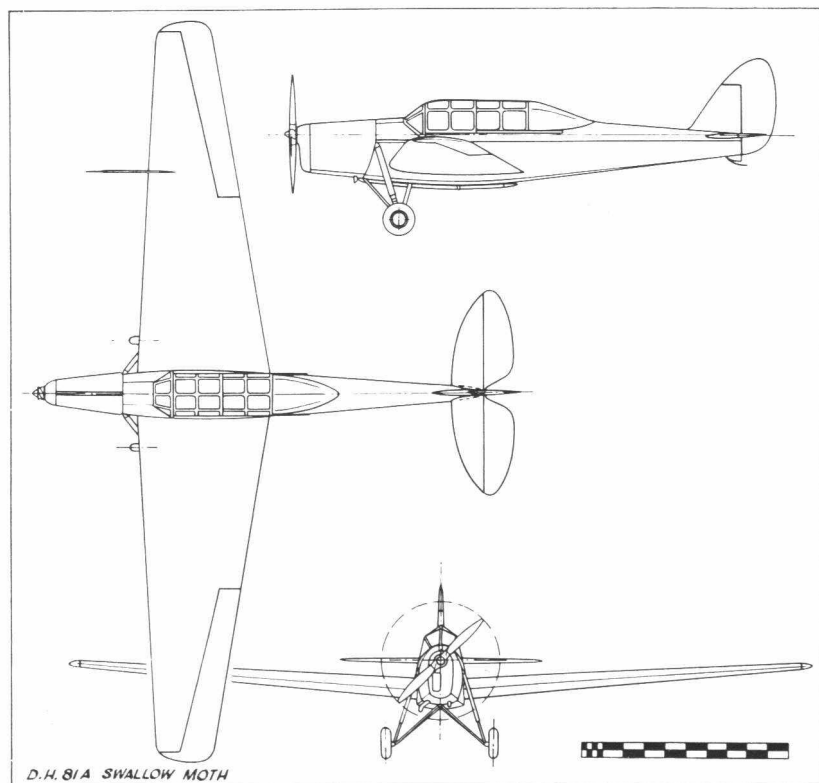
Power Plant: One 80 h.p. de Havilland Gipsy IV

Dimensions: Span 35 ft. 6 in. Length 23 ft. 6 in.
Height 8 ft. 4 in. Wing area 149 sq. ft.

Weights: All-up weight 1,330 lb.

Performance: (D.H.81) Maximum speed 117 m.p.h.
(D.H.81A) Maximum speed 129 m.p.h.

Production: Prototype only, c/n 1992, unregistered, flown as E-7.



K2579, c/n 1751, an early production Tiger Moth for the R.A.F., showing the fabric covered rear decking of the D.H.82. (Crown Copyright Reserved.)

De Havilland D.H.82A Tiger Moth

Experience with the Puss Moth had shown the advantages to be gained from the use of inverted engines and inevitably the D.H.60T Moth Trainer acquired the Gipsy III. To meet Air Ministry Specification 15/31 the instructor's escape route was further improved by moving all the centre section struts forward of the front cockpit. Large movements of CG position were avoided by fitting mainplanes having 19 inches of sweep-back at the tips and thus creating the Tiger Moth, one of the greatest biplane trainers of all time. It was structurally identical to its predecessor and the eight pre-production aircraft were all exported under the designation D.H.60T Tiger Moth, so that for a short transitional period the suffix T changed in meaning from Trainer to Tiger Moth. Two, *E-5/G-ABNJ* and *G-ABPH*, were tested at Martlesham in September 1931, the second having increased dihedral on the lower wing and increased sweepback which led to a change in type number to D.H.82, the first aircraft to bear it being *G-ABRC*, first flown at Stag Lane under B conditions as *E-6* on October 26, 1931. After certification trials it was cleared for aerobatics at an all-up weight of 1,750 lb. and adopted as the standard trainer of the R.A.F.

The 35 aircraft of the initial order to Specification T.23/31 were despatched to Grantham for distribution to the Central Flying School and other training units and five were used by the C.F.S. for inverted formation flying at the 1932 Hendon Air Display. The Air Ministry then ordered two more Tiger Moths, *S1675-6* to Specification T.6/33, which were fitted with Short twin floats prior to trials at Rochester and Felixstowe. Large scale production which began at Stag Lane and later continued at Hatfield,



S1676, c/n 1775, second of two D.H.82 Tiger Moth seaplanes evaluated by the R.A.F. in 1932. ('Flight' Photo 11424.)

was allotted the constructor's number sequences commencing at 3100 and later at 82000. Like the Moth Trainer, the Tiger Moth was offered in gunnery, bombing and photographic versions but only a small number of multi-purpose machines were ordered, the main demand being for *ab initio* and aerobatic trainers which sold in 25 countries including Brazil, Denmark, Persia, Portugal, Spain and Sweden. Productive effort was centred at first on contracts for the R.A.F. and foreign governments but included a number of civilian machines for the Elementary and Reserve Flying Schools, where R.A.F. pilots were taught under the Expansion Scheme before going to the Service Flying Training Schools. Civil Tiger Moths (which did not have mass balanced rudders and ailerons), were operated by the Bristol Aeroplane Co. Ltd. at Filton and Yatesbury; the de Havilland School of Flying Ltd., Hatfield (later Panshanger) and White Waltham; Brooklands Aviation Ltd., Sywell; the Phillips and Powis School of Flying, Woodley; Reid and Sigrist Ltd., Desford; Airwork Ltd., Perth; and Scottish Aviation Ltd., Prestwick. Few could be spared for normal civilian use but four, *G-ABRC*, 'UL', *G-ACEZ* and 'FA', were released to Sir Alan Cobham for aerobatics with National Aviation Day Displays, *G-ACDY* to the Scottish Motor Traction Co. Ltd., *G-ADWG* to C. W. A. Scott's Air Display and *G-ABTB* to Standard Telephones Ltd.

In 1934 the Air Ministry ordered 50 examples of an improved version to Specification T.26/33 which called for the new 130 h.p. Gipsy Major engine, plywood decking to the rear fuselage in place of time honoured fabric and stringers, and a blind flying hood over the rear cockpit. In this form it was known in the R.A.F. as the Tiger Moth II, but outside the Service its proper designation was D.H.82A Tiger Moth. In the following year further contracts were awarded to Specification T.7/35 and others were supplied to the Uruguayan Army and to the Air Forces of Brazil,

Denmark, Iraq, South Africa, Persia and Spain. After 1937 production overtook military commitments, enabling Tiger Moths to replace the venerable Gipsy and Cirrus Moths in the flying clubs. Overseas civilian orders were also accepted from clubs and private owners in Australia, Egypt, Greece, Holland, India, Lithuania, Moçambique, New Zealand, Southern Rhodesia and Switzerland, the largest customer being France which bought 17. In 1937 an order was placed with de Havilland Aircraft of Canada Ltd. for 25 Tiger Moths for the R.C.A.F. and a year later the firm was asked to supply 200 fuselages to the parent company but it is evident that not all of these reached England. By the outbreak of war 1,150 had been built at Hatfield, 227 at Toronto, one at Wellington, New Zealand and three for the London Aeroplane Club by the de Havilland Aeronautical Technical School.

The majority of British and Commonwealth civil Tiger Moths were impressed into their respective air forces in 1939 when in common with their Service brethren they were fitted with Mod. 112, comprising anti-spinning strakes on each side of the rear fuselage. These were first fitted to *R5129*, tested at Farnborough in November 1941 during an investigation into spinning troubles which were cured by removing aileron mass balances. In England the civilian schools contributed 124 aircraft as under—

E.F.T.S.	Base	Contract	Date	Impressment Serials
No. 1	Hatfield . . .	A113012/40	30.10.40	BB723-BB760
No. 13	White Waltham . .			
No. 6	Sywell . . .	A113015/40	17. 9.40	BB693-BB706
No. 7	Desford . . .	A113017/40	3. 1.41	BB788-BB792
No. 8	Woodley . . .	A113013/40	9.10.40	BB851-BB868
No. 11	Perth . . .	A113011/40	19. 9.40	BB815-BB819
No. 12	Prestwick . . .	A113016/40	12.10.40	BB672-BB692
				BB794-BB814

The Bristol fleet operated with No. 2 E.F.T.S. Filton (Staverton from July 1940) and No. 10 E.F.T.S. Yatesbury, but on September 5, 1940 all but *G-ACBA* and 'ETP' were taken over under Contract A109869/40 and shipped to India to become *VT-ANU-OP*. Another 41 Tigers were impressed from various flying clubs during the first eight months of 1940 and about 30 were exported to India, South Africa and elsewhere by W. S. Shackleton Ltd.

In 1941 all Hatfield factory space was required for the Mosquito, and Tiger Moth production was transferred to the assembly line of Morris Motors Ltd. at Cowley, Oxford so that total output to August 15, 1945 exceeded 8,000 aircraft, including 3,065 built by de Havilland at Hatfield, 3,214 by Morris at Cowley while the overseas companies contributed the remainder. Large numbers of Australian-built Tiger Moths were shipped to



A Canadian built Menasco-engined D.H.82C Tiger Moth of the Royal Canadian Air Force. (J. F. McNulty Photo.)

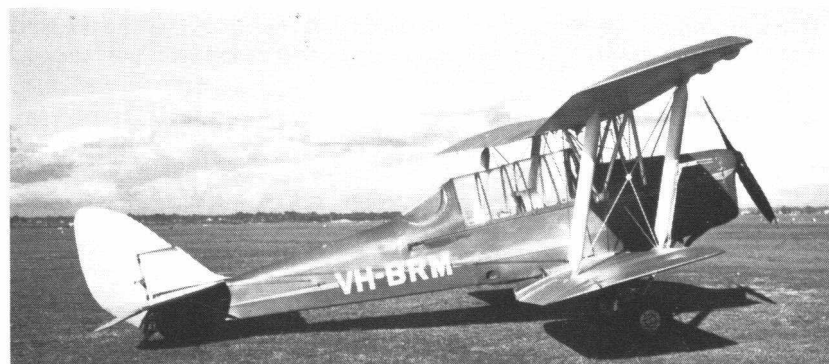
Southern Rhodesia and South Africa for use under the Commonwealth Air Training Plan which also operated in Canada where the Tiger was redesigned and adapted to local conditions by de Havilland Aircraft of Canada Ltd. A two piece nose cowling which hinged along the centre line and opened down the front for improved accessibility, housed a Gipsy Major 1C engine. By shortening the radius rods, the main undercarriage was moved forward to prevent nosing over when using the brakes which were fitted, together with a heavy duty tail wheel to improve ground handling. To combat the sub-zero temperatures of the Canadian winter, the cockpits were heated and covered by a large sliding canopy and later when supplies of Gipsy Majors were cut off by the Battle of the Atlantic, the American-built 125 h.p. Menasco Pirate engine was fitted. The external appearance was so changed, even the familiar wide-chord interplane struts having given place to narrow steel tubular members, that a new designation D.H.82C was warranted. Alternative wheel, ski and float undercarriages were provided and flying training went on all the year round. Two hundred Gipsy Major powered D.H.82Cs bought by the United States Government in 1942 under the model number PT-24, were also delivered to the R.C.A.F.

The Tiger Moth was also built under licence in considerable numbers in Portugal, Norway and Sweden as detailed at the end of this chapter. Late production Norwegian-built machines were equipped with brakes. R.A.F. serials *BS900-936*, *BS949-997*, *BT111-136*, *BT153-183*, *BT197-241*, and *BT261-272* were allotted to 200 Tiger Moths assembled in Bombay from imported components. These are almost certainly those later renumbered in the Indian Air Force *HU* series.

An approaching invasion and a shortage of suitable anti-submarine aircraft led to the fitting of Tiger Moths in 1939-40 with under-wing racks for eight 20 lb. bombs and after release tests at Hatfield by Maj. Hereward de Havilland, 1,500 sets of racks were distributed to Elementary and

Reserve Training Schools in the United Kingdom where, throughout the war, R.A.F. pilots were given *ab initio* instruction on Tiger Moths prior to posting to Service training schools. Later, in the Burma campaign, the Tiger again left its training role to become an ambulance carrying one casualty. The aircraft was flown from the front seat and the unfortunate patient lay under a hinged decking in what had once been the rear cockpit, the luggage locker and an extension thereof.

After the war the Tiger Moth was used in Britain by University Air Squadrons and R.A.F.V.R. schools until completely replaced by the Chipmunk in February 1955. It continued in service however with the Royal Navy, which in February 1960 still had eleven airworthy examples for glider towing and use at the Royal Naval Engineering College, Plymouth. They included three impressed in 1939, a former R.A.A.F. machine *A17-84*, and four ex-civil aircraft *XL714-717* bought from Hants and Sussex Aviation Ltd. in 1956. Large numbers of surplus R.A.F. Tigers were disposed of to military and civil authorities in France, Belgium, Holland and elsewhere from 1946 and a flood also descended on the British market in 1950. At a time when no new light aeroplanes were available, the type took on a new lease of life and every aerodrome had one or more club or private Tigers, with half dismantled specimens in the background to provide spares. On many the standard 19 gallon fuel tank was replaced by the 25 gallon Queen Bee type and all over the world they performed every kind of aerial work such as glider towing, dropping parachutists or advertising. For top dressing purposes a large hopper was fitted in the front cockpit to carry phosphates which ejected under the control of the pilot through a metal venturi beneath the fuselage. In the crop spraying role insecticide was forced through perforated piping under the wings by a wind driven pump, a system later superseded by rotary atomisers on the lower mainplanes. After 1947 large numbers were used in New Zealand for this purpose. Operating from unsuitable fields and annually performing an incalculable number of stalled turns near the



An Australian-built Tiger Moth *VH-BRM*, c/n 1083, with the canopy from a Commonwealth Wackett trainer.

ground, their casualty rate was high but the tonnage dropped ran into thousands and they founded a new industry.

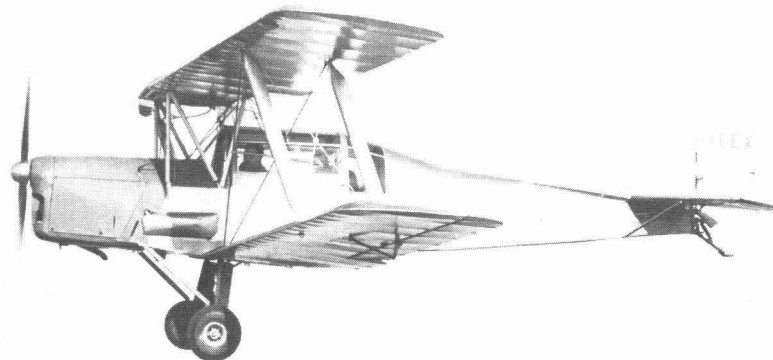
Specialised Tiger Moth conversions fell into four main categories, the addition of cabin tops, the fitting of electric starters and inverted fuel systems, the mandatory addition of large dorsal fins in Holland, and complete reconstruction as cabin four seaters. One-off cabin conversions were many and varied, such as the coupé top fitted to *G-AIZF* by H. M. Woodhams at Baginton in 1950, but Rollason Aircraft and Engines Ltd. devised the Taxi Tiger with a simpler canopy covering only the front cockpit later flown on C. M. Roberts' *G-AHVU*. A more elaborate conversion was made at White Waltham to *G-ANSA* by Personal Plane Services and at least one was equipped in Australia with the canopy from a Commonwealth Wackett. Electric starters were fitted to Belgian



C. A. Nepean Bishop leading a Tiger Club tied-together formation in to land at Stapleford in "The Bishop", *G-APDZ*, c/n 83699. This was the prototype of several aerobatic conversions with Gipsy Major 1C and no centre section tank. (J. B. Griffiths Photo.)



The Nationale Luchtvaart School's Tiger Moth *PH-UAW* fitted with the outsize dorsal fin made mandatory by the Dutch authorities. (By courtesy of Philip Jarrett.)

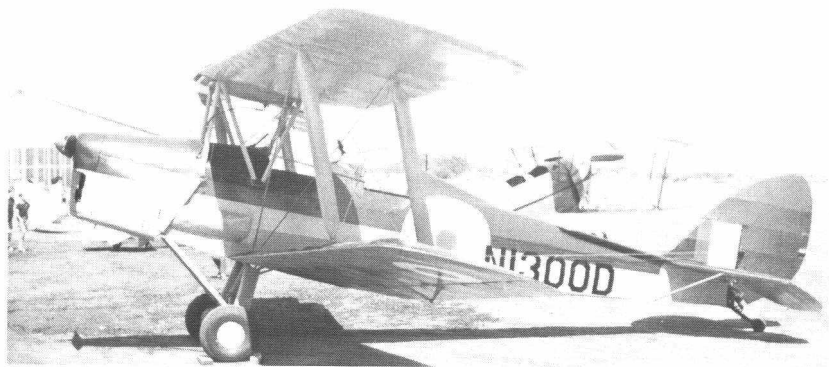


A Thruxton Jackaroo four seat cabin conversion. (R. A. Cole Photo.)

Air Force machines in 1956 and *G-APLI* was similarly equipped to special order by Rollasons in 1960.

Sundry temporary racing single seaters appeared in postwar air races, at least *G-AIVW* being flown from the front seat. To combat strong foreign competition for the Lockheed International Aerobatic Trophy, four Tiger Moths were modified by Rollasons and emerged as single seaters with 145 h.p. Gipsy Major 1C high compression engines, metal airscrews, inverted fuel systems, thin centre sections with the fuel tanks transferred to the front cockpit, and oversize elevators. Stemming from that of the Tiger Club C.F.I., C. A. Nepean Bishop, their names were "The Bishop" *G-APDZ* (1958), "The Archbishop" *G-ANZZ* (1959), "The Deacon" *G-AOAA* and "The Canon" *G-ANMZ* (1960). To underline their inverted flying potential Elwyn McAully, star aerobatic performer of the Tiger Club, flew inverted from Lympne to Le Touquet in "The Archbishop" on June 27, 1959. Twenty-five years earlier on July 25, 1934 Geoffrey Tyson had marked the 25th anniversary of Bleriot's cross Channel flight by performing a similar feat in one of the first Tiger Moths, *G-ACEZ*.

Standard Tiger Moths spin positively to the right if the speed is reduced below 40 m.p.h. or can be ruddered into a left hand spin, the rate of which was considerably reduced by the wartime anti-spinning strakes, later often removed. The very large dorsal fin considered necessary by the Nationale Luchtvaart School at Ypenburg made no apparent difference to spinning characteristics but nevertheless this modification was made to their entire fleet, to several Dutch private Tiger Moths and even to British machines on hire in that country. A more drastic conversion known as the Jackaroo, built at Thruxton by Jackaroo Aircraft Ltd. involved cutting the front fuselage in half lengthways and welding extension pieces in the cross members to widen the fuselage to accommodate four passengers in side by



Shipped from Indonesia and flown by B. L. Davidson at Heber Springs, Arkansas, *N1300D* (ex *PG685* and Dutch *A-4*), was one of over 100 Tiger Moths registered in the United States in 1976. (*J. W. Underwood Photo.*)



The Tiger Moth *T7438*, c/n 83817, converted by Film Aviation Services Ltd. at Croydon in 1961 to represent a Fokker D.VII for the film "Lawrence of Arabia". (*Photo courtesy of D. M. Kay.*)

side pairs. Both the undercarriage track and centre section were also widened with a resultant increase in span and although initially powered by the Gipsy Major 1, most Jackaroos later had the 1C engine to improve take off and climb. Nineteen were produced at Thruxton 1957-59, Mk. 1 and Mk. 3 being cabin versions, the latter e.g. *G-APAO*, having a metal framed canopy in place of the earlier wooden structure and also provision for brakes. The Mk. 2 was an agricultural single seater which proved unsuccessful and the only example, *G-AOEY*, was re-converted to Mk. 1 standard. One other Jackaroo, *G-APOV*, was built for the Tiger Club by Rollason Aircraft and Engines Ltd. in 1959 but was aerodynamically cleaner with widened rear fuselage and improved cowlings. Jackaroos were

used principally for instruction by the Wiltshire School of Flying Ltd. but single examples were operated by the Blackpool and Fylde Aero Club; Caledonian Flying Services Ltd., Renfrew; and by private owners such as Miss Sheila Scott. One was flown to Nigeria by F. J. Ibbotson for crop spraying in 1959 and another was employed for the same purpose in the Argentine.

Probably the last and certainly the most imaginative of all Tiger Moth reconstructions were made at Croydon by Film Aviation Services Ltd. early in 1961 for the film "Lawrence of Arabia". One, illustrated here, was made to resemble a Fokker D.VII and two others, *R5146/G-ANNF* and *T6945/G-ANLC*, became Rumpier C.Vs.

SPECIFICATION AND DATA

Manufacturers: The de Havilland Aircraft Co. Ltd., Stag Lane Aerodrome, Edgware, Middlesex, works transferred to Hatfield Aerodrome, Herts. in 1934
Morris Motors Ltd., Cowley, Oxford
de Havilland Aircraft of Canada Ltd., Downsview Airport, Toronto
de Havilland Aircraft Pty. Ltd., Bankstown Aerodrome, Sydney, N.S.W.
de Havilland Aircraft of New Zealand Ltd., Rongotai, Wellington
Oficinas Gerais de Material Aeronautico, Alverca do Ribatejo, Portugal
Haerens Flyvemaskinefabrik, Kjeller, Norway
A.B. Svenska Järnvagsverkstäderna, Lidingö, Stockholm, Sweden

Power Plants: (D.H.82) One 120 h.p. de Havilland Gipsy III
(D.H.82A) One 130 h.p. de Havilland Gipsy Major 1
(D.H.82A) One 130 h.p. de Havilland Gipsy Major 1F*
One 145 h.p. de Havilland Gipsy Major 1C
(D.H.82C) One 145 h.p. de Havilland Gipsy Major 1C
One 125 h.p. Menasco Pirate D.4
(Jackaroo) One 130 h.p. de Havilland Gipsy Major 1
One 130 h.p. de Havilland Gipsy Major 1F*
One 145 h.p. de Havilland Gipsy Major 1C

*The Gipsy Major 1F had aluminium heads and ran on leaded fuel.

Dimensions, Weights and Performances:

	D.H.82	D.H.82A	D.H.82C Gipsy Major	Jackaroo
Span . . .	29 ft. 4 in.	29 ft. 4 in.	29 ft. 4 in.	30 ft. 4½ in.
Length . . .	23 ft. 11 in.	23 ft. 11 in.	23 ft. 11 in.	25 ft. 0 in.
Height . . .	8 ft. 9½ in.	8 ft. 9½ in.	8 ft. 10 in.	9 ft. 6 in.
Wing area . .	239 sq. ft.	239 sq. ft.	239 sq. ft.	239 sq. ft.
Tare weight . .	1,075 lb.	1,115 lb.	1,200 lb.***	1,360 lb.
All-up weight .	1,825 lb.*	1,825 lb.**	1,825 lb.	2,180 lb.
Maximum speed .	109 m.p.h.	104 m.p.h.	107 m.p.h.	102 m.p.h.
Cruising speed .	85 m.p.h.	90 m.p.h.	90 m.p.h.	90 m.p.h.
Initial climb . .	700 ft./min.	635 ft./min.	750 ft./min.	600 ft./min.
Ceiling . . .	17,000 ft.	14,000 ft.	14,600 ft.	—
Range . . .	300 miles	300 miles	275 miles	250 miles

* D.H.60T Tiger Moth 1,643 lb., D.H.82 seaplane 1,750 lb.

** Australian agricultural 2,000 lb.

*** Skiplane 1,255 lb.

Production:

(a) D.H.60T Tiger Moths

Constructor's Numbers	Aircraft markings
1724-1730 1732	<i>G-ABNY</i> , 'NG', 'NI' (to D.H. Canada 7.34 as <i>CF-APL</i>), 'NJ'- <i>NM G-ABPH</i>

(b) D.H.82 Tiger Moths

Constructor's Numbers	Aircraft markings
1733 1739-1773 1774-1775 1796 3100-3151 3152-3174	<i>G-ABRC</i> <i>K2567-K2601</i> under A.M. Contract 120255/31, delivered 11.31-2.32 <i>S1675-S1676</i> under A.M. Contract 113208/31 <i>G-ABSK</i> <i>VR-HAR</i> , <i>G-ABTB</i> , 'SW'- <i>TA</i> , 'UL', Swedish Air Force (4), <i>SE-ADE-DH</i> , Japan, Persian Air Force 101-120, <i>G-ABYJ</i> , Swedish Air Force (4), <i>D-2357</i> , Brazil (5), <i>G-ACBN</i> , Shanghai (3) <i>G-ACBA-BG</i> , Portuguese Air Force (11), Danish Air Force <i>S.I-S.5</i>

(c) D.H.82A Tiger Moths

Constructor's Numbers	Aircraft markings
3175-3199 3200-3237 3238-3287 3288-3336 3337-3398 3399-3463 3464-3501 3502-3518 3519-3552	<i>G-ACDA-DC</i> , 'DE'- <i>DK</i> , 'EH', 'EZ', 'FA', 'GE', 'DY', <i>PH-AJG</i> , <i>G-ACJA</i> , Spanish Air Force 33-2 to 33-5, Danish Air Force <i>S.6-S.9</i> Persian Air Force 121-129, Danish Air Force <i>S.10-S.12</i> , Portuguese Air Force (10), Austrian <i>A-78</i> , <i>G-ACSK</i> , 'VK', 'VL', 'WB', Australia, Persian Air Force 130-139 <i>K4242-K4291</i> under A.M. Contract 307396/34, delivered 8.34-4.35 Uruguay No. 1, <i>OA-CCH</i> , Persian Air Force 140-159, Uruguay Nos. 2-5, <i>G-ACYN</i> , 'ZY', 'ZZ', Danish Air Force <i>S.13</i> , <i>G-ADCG</i> , 'CH', <i>VH-UTD</i> , Iraqi Air Force 40-42, Brazilian Air Force 2-1-5 to 2-1-16, <i>OY-DOK</i> <i>G-ADGS-GZ</i> , 'GF'- <i>GH</i> , <i>CF-avg</i> /R.C.A.F. 238, <i>G-ADIH-IJ</i> , 'TW'- <i>JA</i> , 'LU', <i>VT-AGO</i> , 'GR', <i>G-ADLX</i> , 'KG', 'LZ', 'MA', 'LV', 'LW', 'HY'- <i>IC</i> , 'HR'- <i>HX</i> , 'JB'- <i>JJ</i> , 'OW'- <i>PH</i> <i>G-ADOF-OR</i> , 'NP'- <i>OB</i> , 'SI', 'SH', 'UC', 'UK', 'VN'- <i>VP</i> , 'XB'- <i>XE</i> , 'XI', 'XJ', 'XT'- <i>XX</i> , 'VX'- <i>VZ</i> , 'WA'- <i>WF</i> , 'WJ'- <i>WP</i> , 'XK', 'XN'- <i>XR</i> , <i>VT-AHD</i> , 'HE' Persian Air Force 160-169, <i>G-ADHN</i> , 'XZ'- <i>YB</i> , <i>CF-CBR</i> , 'BT', 'BU', 'BS', Iraqi Air Force 43-45, <i>G-AEBY</i> , 'BZ', Iraqi Air Force 46, <i>G-AECG-CJ</i> , <i>G-ADWG</i> , <i>LY-LAT</i> , <i>OE-DAX</i> , <i>G-AEEA</i> , South Africa (2), <i>G-AEID</i> , Uruguay No. 6, <i>K8336-K8337</i> seaplanes under A.M. Contract 419031/35, delivered 29.10.36 <i>VT-AHL</i> , Uruguay Nos. 7-9, South Africa, <i>VP-YBG</i> , <i>VH-UVZ</i> , <i>G-AELA-LD</i> , 'LP', 'MF', <i>VH-UXC</i> , <i>G-AEMU</i> , 'NK', South Africa <i>VP-YBH</i> , <i>VT-AIF</i> , <i>G-AEOE</i> , <i>ZS-AIN</i> , 'IO', <i>OE-DIK</i> , <i>ZS-AIL</i> , 'IM', <i>OE-DAF</i> , <i>ZS-AIP</i> , 'IR', South Africa (2), <i>VP-CAB</i> , South Africa (4), <i>VR-RAM</i> , Iraqi Air Force (4), <i>LY-LAM</i> , <i>G-AERW</i> , 'SA', 'SC', Iraqi Air Force (6), <i>G-AESD</i>

Constructor's Numbers	Aircraft markings
3553-3583	<i>L6920</i> , '21', '32', '33', '22', '23', '34', '35', <i>G-AETO</i> , <i>L6939</i> , '40', '46', '42', '43', '27', '28', '24', '25', '36', '37', '41', <i>G-AETP</i> , <i>L6949</i> , '47', '29', '30', '44', '45', '26', <i>G-AESM</i> , <i>L6938</i>
3584-3600	<i>G-AEXG</i> , <i>L6931</i> , <i>G-AESN</i> , 'SO', <i>L6948</i> , <i>G-AEWG</i> , South Africa, <i>VR-RAN</i> , 'AO', <i>VH-UYJ</i> , <i>G-AFDC</i> , 'DD', South Africa, <i>SU-ABX</i> , <i>VH-UYK</i> , <i>G-AEUV</i> , <i>VH-UYL</i>
3601-3625	<i>VT-AIS</i> , <i>G-AFAI</i> , <i>VP-YBO</i> , <i>ZS-AJA</i> , South Africa, <i>CR-AAG</i> , South Africa, <i>SU-ABY</i> , South Africa (2), Danish Air Force <i>S.15</i> , Uruguay Nos. 10-18, <i>VH-UYR</i> , 'YP', 'YQ', <i>G-AEJC</i> , South Africa
3626-3653	<i>ZS-AMN</i> , <i>G-AFAR</i> , 'AS', <i>ZK-AFN</i> , 'FO', South Africa, <i>VH-UZT</i> , South Africa, <i>ZS-AMZ</i> , <i>VH-UZV</i> , South Africa, <i>G-AFCA</i> , <i>ZK-AFY</i> - <i>'GA</i> , 'FU'- <i>FX</i> , Portuguese Air Force (9)
3654-3676	<i>ZK-AGE</i> , <i>F-AQJU</i> , 'JV', 'JX'- <i>JZ</i> , South Africa, <i>VT-AJU</i> , South Africa, <i>ZS-ANU</i> , <i>G-AFEJ</i> , <i>F-AQNF</i> - <i>'NJ</i> , <i>VH-AAE</i> , <i>ZK-AGF</i> , <i>ZS-ANV</i> , South Africa, <i>G-AFFO</i> , South Africa (2)
3677-3706	<i>F-AQOS</i> , <i>VP-RAG</i> , <i>G-AFGJ</i> , <i>ZK-AFP</i> , <i>G-AFGT</i> , 'HI', Moçambique, <i>G-AFGW</i> , <i>F-AQOZ</i> , 'OQ', 'OV', 'OX', <i>VH-AAI</i> , 'AJ', <i>F-AQOY</i> , <i>F-ARAR</i> , <i>ZK-AGG</i> , South Africa, <i>G-AFHT</i> , <i>ZK-AGH</i> , 'GI', South Africa, <i>G-AFGY</i> , 'GZ', <i>VP-YBW</i> , <i>HB-OKU</i> , <i>VH-ABM</i> , 'AR', <i>ZK-AGL</i> , <i>G-AFFA</i>
3707-3750	<i>N5444-N5457</i> , <i>SX-AAK</i> , <i>G-AFJF</i> , <i>VH-AAP</i> , <i>G-AFJG</i> , 'JH', <i>N5458-N5477</i> , <i>VH-AAK</i> , <i>G-AFJI</i> , 'JK', 'JL', <i>VP-CAE</i>
3751-3795	<i>N5478-N5492</i> , <i>G-AFJM</i> , 'JN', South Africa, <i>ZS-APF</i> , South Africa, <i>ZS-APE</i> , <i>N5493</i> , <i>N6443-N6458</i> , <i>ZK-AHA</i> , <i>G-AFLX</i> , South Africa, <i>VT-AKS</i> , <i>G-AFMC</i> , 'MD', <i>ZK-AGZ</i>
3796-3827	<i>N6459-N6490</i> under A.M. Contract 778402/38
3828-3869	<i>N6519-N6522</i> , <i>ZK-AHB</i> , 'GW'- <i>GY</i> , <i>N6523-N6556</i>
3870-3900	<i>N6576-N6585</i> , <i>VT-AKW</i> , <i>G-AFNP</i> - <i>'NV</i> , <i>N6586-N6599</i>
3901-3936	<i>N6600-N6625</i> , <i>N6630-N6632</i> , Persian Air Force (5), <i>ZK-AHF</i> , 'HG'
3937-3999	<i>N6633-N6674</i> , <i>N6706-N6726</i>
82000-82033	<i>N6727-N6730</i> , <i>G-AFSX</i> , Persian Air Force (5), <i>N6732-N6755</i>
82034-82082	<i>N6770-N6782</i> , Persian Air Force (5), <i>ZK-AHH</i> , <i>N6783-N6812</i>
82083-82138	<i>N6834-N6842</i> , Persian Air Force (5), <i>G-AFSG</i> , <i>N6843-N6882</i> , <i>N6900</i>
82139-82181	<i>G-AFSH</i> , 'SK', 'SL', 'SI', <i>ZS-API</i> , 'RG', <i>N6901-N6937</i>
82182-82199	<i>G-AFSJ</i> , 'SM', 'SN', 'NL', 'NM', 'WT', <i>N6938-N6949</i>
82200-82232	<i>N6962-N6988</i> , <i>N9114-N9116</i> , <i>ZK-AHO</i> , 'HM', 'HR'
82233-82292	<i>G-AFTI</i> , 'XZ', 'YA', <i>N9117-N9162</i> , <i>N9171-N9181</i>
82293-82332	<i>G-AFZC</i> , R.N.Z.A.F. (5), <i>N9182-N9215</i>
82333-82349	<i>N9238-N9248</i> , R.N.Z.A.F. (4), <i>VH-ADH</i> , 'DI'
82350-82397	<i>N9249-N9279</i> , <i>N9300-N9310</i> , <i>NZ746-NZ751*</i>
82398-82518	<i>N9311-N9349</i> , <i>N9367-N9376</i> , <i>VP-TAC</i> , 'AD', <i>N9379-N9410</i> , <i>N9427-N9464</i>
82519-82583	<i>N9492-N9523</i> , <i>R4748-R4749</i> , <i>N9377-N9378</i> , R.A.A.F. <i>A17-1</i> to <i>A17-20</i> , <i>G-AFTJ</i> , <i>VT-ALL</i> , 'LB'- <i>LH</i>
82584-82595	<i>G-AFSP</i> - <i>'SU</i> , 'WC'- <i>WF</i> , 'YB', 'YC', 'ZD' (Canadian fuselages E.100-E.114)
82596-82598	Impressed in Kenya (3)
82599-82690	Reserved for Canadian fuselages
82691-82741	<i>R4750-R4771</i> , <i>NZ752-NZ754*</i> , <i>R4772-R4797</i>
82742-82841	<i>R4810-R4859</i> , <i>R4875-R4918</i> , <i>NZ755-NZ760*</i>
82842-82875	<i>R4919-R4924</i> , <i>R4940-R4965</i> , <i>XY-AAB</i> , 'AC'
82876-82937	<i>R4966-R4989</i> , <i>R5005-R5036</i> , South Africa (6)
82938-82981	<i>R5037-R5042</i> , <i>NZ763-NZ768*</i> , <i>R5043-R5044</i> , <i>R5057-R5086</i>
82982-83082	<i>R5100-R5149</i> , <i>R5170-R5214</i> , <i>NZ769-NZ774*</i>
83083-83124	France (7), <i>R5215-R5219</i> , <i>R5236-R5265</i> (<i>R5256-R5265</i> packed for Australia)

* Royal New Zealand Air Force.

(d) D.H.82A Tiger Moths (mass production for the R.A.F.)

(Constructor's numbers commencing 83125 but irregular thereafter. T5360-T6991 Hatfield-built; commencing T7011 all built by Morris Motors Ltd., Cowley, Oxford.)

T5360-5384	T6734-6778	T8022-8066	DF111-159
T5409-5433	T6797-6831	T8096-8145	DF173-214
T5454-5503	T6854-6878	T8166-8210	EM720-756
T5520-5564	T6897-6921	T8230-8264	EM771-819
T5595-5639	T6942-6991	DE131-178	EM835-884
T5669-5718	T7011-7055	DE192-224	EM893-931
T5749-5788	T7085-7129	DE236-284	EM943-989
T5807-5856	T7142-7191	DE297-323	NL690-735
T5877-5921	T7208-7247	DE336-379	NL749-789
T5952-5986	T7259-7308	DE394-432	NL802-847
T6020-6069	T7325-7369	DE445-490	NL859-898
T6094-6138	T7384-7418	DE507-535	NL903-948
T6158-6202	T7436-7485	DE549-589	NL960-999
T6225-6274	T7509-7553	DE603-640	NM112-158
T6286-6320	T7583-7627	DE654-697	NM171-214
T6362-6406	T7651-7700	DE709-747	PG614-658
T6427-6471	T7723-7757	DE764-791	PG671-716
T6485-6534	T7777-7821	DE808-856	PG728-746
T6547-6596	T7840-7884	DE870-904	Further
T6612-6656	T7899-7948	DE919-957	allotment
T6671-6720	T7960-8009	DE969-999	cancelled.

Note: The following 91 partially-built aircraft were transferred from Hatfield to Cowley for completion: T5611-5639, T5669-5718, T5749-5788, T5807-5813. T5360 and T5361 packed for Australia 19.4.40, T5600 delivered 31.5.40, T7011 7.5.40, DE131 7.12.40, PG746 24.7.44

(e) D.H.82A Tiger Moths built to overseas order

Constructor's Numbers	Aircraft markings
83202-83207	NZ775-780 Assembled in New Zealand for the R.N.Z.A.F. with
83379-83396	NZ781-798 c/n DHNZ.25-48
83352, 53, 55	Persian Air Force (3)
83357-83363	Persian Air Force (7)
83515-83519	South African Air Force (5)
83571-83572	VT-AMI, VT-AMJ
83587-83588	VT-AMK, VT-AML
83599-83601	VT-AMM to VT-AMO
83627-83633	VT-AMP to VT-AMV
83654-83660	VT-AMW to VT-ANC
83701-83705	VT-AND to VT-ANH
83746	VT-ANI
83774-83783	Untraced (10)

(f) D.H.82A Tiger Moths built by the de Havilland Aeronautical Technical School 1934-36

Total 3. c/n 1993 . . G-ACPS; 2262 . . G-ADGO; 2264 . . G-AEVB

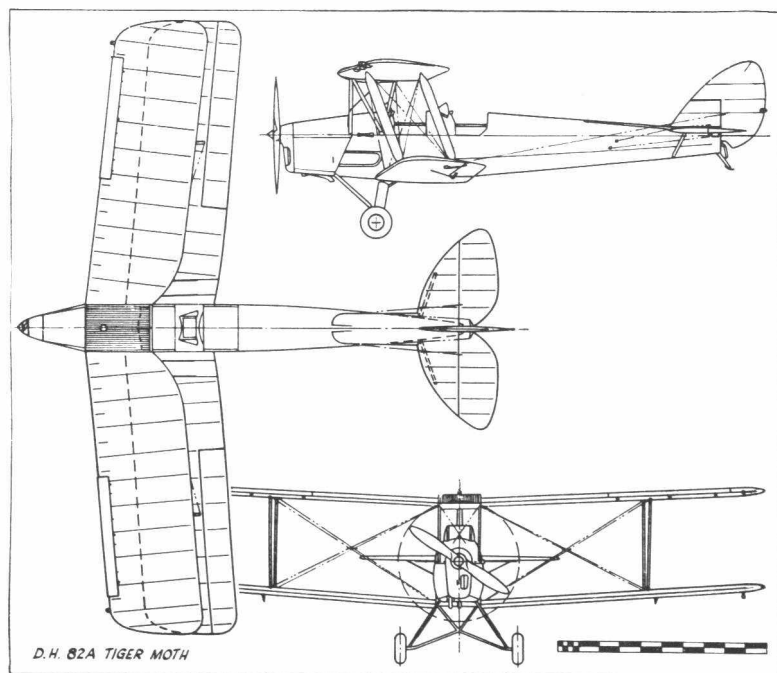
(g) D.H.82A Tiger Moths built by de Havilland Aircraft Pty. Ltd. in Australia 1940-1945

021-140	A17-24 to A17-143, delivered to R.A.A.F. commencing 6.40
141	PK-SBG, purchased by Netherlands Indisch Luchtvaart Fonds (N.I.L.F.), and assembled at Soerabaja, Netherlands East Indies, 10.40
142	A17-144, R.A.A.F.
143-145	PK-SBH, PK-SBE, PK-SBF, details as for c/n. 141
146-236	A17-145 to A17-235, delivery to R.A.A.F. completed 12.40
237-249	VT-API, 'PN', 'PO', 'PF', 'PG', 'PJ', 'PM', 'PP', 'PH', 'PQ', 'PK', 'PL', 'PR delivered to the Indian Government 2.41
250-251	Two aircraft delivered to the Burmese Government 2.41
252-254	VT-ANN, 'NQ' and 'NO' delivered to the Madras Flying Club 2.41
255-360	A17-236 to A17-341 delivered to R.A.A.F. 12.40-4.41
361-368	VT-APW to VT-AQD delivered to the Indian Government 7.41
369	VH-AEB delivered to Broken Hill Flying Club 4.41
370-376	VT-AQE to VT-AQK delivered to the Indian Government 9.41
377-409	A17-342 to A17-374 delivered to R.A.A.F. commencing 4.41
410-415	PK-SBI to 'SBN', ordered by K.N.I.L. and used by Flying Clubs in the Netherlands East Indies, delivered 6.41
416-431	A17-375 to A17-390 delivered to R.A.A.F. 4.41-6.41
432	PK-PAL delivered to the South Sumatra Flying Club
433-436	A17-391 to A17-394 delivered to R.A.A.F. 4.41-6.41
437-438	delivered to Vrijwillige Vleigers Corps (V.V.C.), Netherlands East Indies and registered in PK-VV* and PK-VW* series
439-448	A17-395 to A17-404 delivered to R.A.A.F. 4.41-6.41
449-486	delivered to V.V.C, Netherlands East Indies
487-506	NZ1401 to NZ1420 delivered to R.N.Z.A.F. 9.41-1.42
507	PK-BPP delivered to Balikpapan Flying Club 8.41
508-517	VT-AQL-AQU
518-525	delivered to V.V.C., details as for c/n. 437-438
526-565	to R.A.F. in South Africa and Southern Rhodesia, flown with c/n. as serial or c/n. prefixed by MC, eg MC561, some to South African Air Force
566	A17-405, R.A.A.F.
567-568	to South African Air Force, c/n. 568 had serial SAAF2341
569	A17-406, R.A.A.F.
570-581	to South Africa/Southern Rhodesia for S.A.A.F./R.A.F.
582-600	A17-408 to A17-425, delivered to R.A.A.F. 9.41-11.41
601-606	DX540 to DX545 delivered to R.A.F. in South Africa/Southern Rhodesia
607-663	(odd numbers only) A17-426 to A17-454, R.A.A.F.
608-630	(even numbers) - DX546 to DX557, delivered to R.A.F. in Southern Rhodesia
632-636	(even numbers) - DX569 to DX571, delivered to R.A.F. in Southern Rhodesia
638-664	(even numbers) - to S.A.A.F. and R.A.F. in Southern Rhodesia (includes DX572 to DX580)
665-666	delivered to S.A.A.F.
667-675	DX581 to DX589, delivered to R.A.F. in Southern Rhodesia
676	delivered to R.A.F. in Southern Rhodesia, flown with c/n. as serial
677	ordered by Medan Flying Club, Netherlands East Indies, 9.41
678-686	delivered to R.A.F. in Southern Rhodesia, flown with c/n. as serial
687	ordered by the Medan Flying Club, N.E.I., 10.41
688-691	delivered to R.A.F. in Southern Rhodesia, flown with c/n. as serial
692-714	DX590 to DX612, delivered to R.A.F. in Southern Rhodesia
715-753	DX627 to DX665, delivered to R.A.F. in Southern Rhodesia
754-791	DX679 to DX716, delivered to R.A.F. in Southern Rhodesia
792-823	A17-642 to A17-673, R.A.A.F., originally intended for R.A.F. as DX717 to DX719, DX738 to DX764 and DX779 to DX780
824-856	A17-692 to A17-724, R.A.A.F., (DX781 to DX813 ntu)
857-871	A17-627 to A17-641, R.A.A.F., (DX814, DX815 and DX827 to DX839 ntu)
872-901	A17-455 to A17-484, R.A.A.F., (DX840 to DX870 ntu)
902-907	supplied to the U.S.A.A.F., probably for use in Australia
908-953	A17-485 to A17-530, R.A.A.F.
954-965	supplied to the U.S.A.A.F.
966-1055	A17-531 to A17-620, R.A.A.F.
1056-1090	A17-725 to A17-759, delivery to R.A.A.F. completed 2.45

(h) Production by de Havilland Aircraft of Canada Ltd. 1938–1945

Constructor's Numbers	Type	Aircraft markings
301–330	D.H.82A	R.C.A.F. 239–258, <i>CF-CFJ</i> , R.C.A.F. 275–279, <i>CF-BNF</i> , untraced, <i>CF-BNC</i> , untraced. Delivered 1.38–5.40
331–734	D.H.82C	R.C.A.F. 4001–4404, delivered 10.4.40–4.3.41
735–744	D.H.82C*	R.C.A.F. 4935–4944, delivered 18.4.41–23.9.41
745–974	D.H.82C	R.C.A.F. 4946–5175, delivered 18.4.41–23.9.41
975–999	D.H.82C	R.C.A.F. 5800–5824, delivered 30.9.41–8.10.41
1000–1001	D.H.82C*	R.C.A.F. 4810 and 4945, delivered 21.1.41 and 29.1.41
1002–1020	D.H.82C*	R.C.A.F. 4812–4830, delivered 21.1.41–19.3.41
1021	D.H.82C*	R.C.A.F. 4811, delivered 2.2.41
1022–1124	D.H.82C*	R.C.A.F. 4831–4933, delivered 19.3.41–29.7.41
1125–1126	D.H.82C*	untraced
1127	D.H.82C*	R.C.A.F. 4934, delivered 12.6.41
1128–1302	D.H.82C	R.C.A.F. 5825–5999, delivered 9.10.41–16.12.41
1303–1502	D.H.82C*	R.C.A.F. 1100–1299, to U.S.A.A.F. order as Model PT-24: <i>FE100–FE266</i> (42-964 to 42-1130) and <i>FH618–FH650</i> (42-1131 to 42-1163), Contract DA/AC/230
1503–1652	D.H.82C	R.C.A.F. 3842–3991, delivered 26.2.42–26.5.42
1653–1801	D.H.82C	R.C.A.F. 8851–8999, delivered 27.5.42–20.8.42
1802–1825	D.H.82C	R.C.A.F. 9645–9668, delivered 20.8.42–28.8.42
1826	D.H.82C	untraced
1827–1853	D.H.82C	R.C.A.F. 9669–9695, delivered 28.8.42–30.9.42

* With 125 h.p. Menasco Pirate D.4.



Swedish-built Tiger Moth *Fv.515* (marked 15-5 on starboard side), an airworthy exhibit at the Air Force Museum, Malmen, was civil from 1953 as *SE-BYM*. (*Aviation Photo News*.)

(i) D.H.82A Tiger Moths built by de Havilland Aircraft of New Zealand Ltd.

Constructor's Numbers	Aircraft markings
DHNZ.49–DHNZ.100 DHNZ.101–DHNZ.181	NZ799–NZ850 NZ1421–NZ1500 and NZ1601

(j) Tiger Moths built under licence

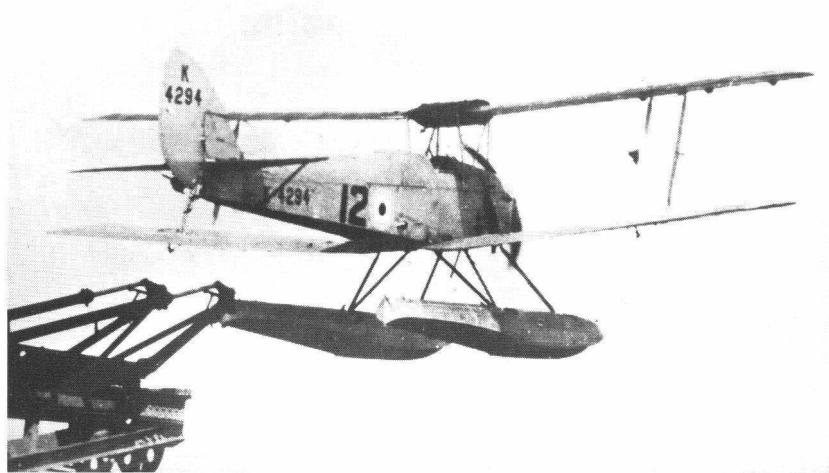
Country	Type	Quantity	Constructor's Numbers	Aircraft markings
Sweden*	D.H.82	3	38–40	<i>Fv.597–Fv.599</i>
	D.H.82A	20	41–50 66–75	<i>Fv.519–Fv.520</i> , <i>Fv.511–Fv.518</i> <i>Fv.509–Fv.510</i> , <i>Fv.546–Fv.550</i> <i>Fv.553</i> , <i>Fv.589–Fv.590</i>
				R.N.A.F. odd numbers only 127–159
Norway	D.H.82	17	149–165	R.N.A.F. odd numbers only 161–191, also 201, c/n 193
	D.H.82A	20	171–190	—
Portugal	D.H.82A	91	P.1–P.91	—

* Swedish Air Force designations were Sk.11 (D.H.82) and Sk.11A (D.H.82A).

(k) Conversions to Jackaroo by Jackaroo Aircraft Ltd., Thruxton, Hants.

Year	Aircraft markings
1957	<i>G-AOEX</i> , 'EY', <i>G-ANZT</i> , <i>G-AOIR</i>
1958	<i>G-APAI</i> , <i>G-ANFY</i> , <i>G-AOIX</i> , <i>G-APAJ</i> , 'HZ', 'IO', 'IV', 'IT'
1959	<i>G-APJV</i> , 'AO', <i>G-AOIW</i> , <i>G-APAL</i> , 'AP', 'AM', 'OV'

* Built at Croydon by Rollason Aircraft and Engines Ltd.



A Queen Bee seaplane K4294, c/n 5090, leaving the catapult of a British cruiser.

De Havilland D.H.82B Queen Bee

The Queen Bee was a radio controlled target aircraft built to Specification 18/33 which although externally similar to a Tiger Moth had but small connection with it. The mainplanes, undercarriage and certain detail fittings were the same, but the fabric covered metal fuselage of the Tiger Moth was replaced by a standard spruce and plywood Moth fuselage for cheapness and buoyancy. The engine was a Gipsy Major, so that the Queen Bee is more correctly described as a Moth Major with Tiger Moth mainplanes, and all the early examples came from the Moth Major production line which from 1935 was given over entirely to the building of Queen Bees.

A normal front cockpit with instruments and flying controls was retained but a fairing was provided with which to cover it during radio controlled flying. The rear cockpit was enclosed by a section of hinged decking to form a compartment near the C.G. for the Farnborough-designed radio control gear, electric power for which was supplied by a wind driven generator on the port side. Extra range was obtained by fitting a 25 gallon instead of a 19 gallon centre section tank. The prototype, K3584, was first flown at Hatfield by the company's test pilot on January 5, 1935 and on June 26th of that year a demonstration of take off, flying, manoeuvring and landing was given at Farnborough with the seventh production aircraft K4227 under commands issued by a push button control panel.

The wheeled undercarriage was fitted only for test flying or ferrying, as when operational the Queen Bee was equipped for catapulting with pick-up slings in the centre section and Short twin metal floats. After a catapult take off, usually from a ship of the Royal Navy, the Queen Bee would fly up and down a predetermined course while gunners did their best to destroy it, afterwards landing on the water to be hoisted inboard.

For initial training a Queen Bee Flight was formed at No. 1 Anti-Aircraft Co-Operation Unit, Henlow, in May 1937 and its first operational launching was made with K8661 at Watchett, Somerset, after it was transferred there on July 27th. Anti-aircraft ranges were always sited on the coast so that in the event of a hit the Queen Bee would fall into the sea without endangering life.

The Queen Bee was built in quantity to Specification 20/35, total output being 320 at Hatfield and 60 at a factory in Glasgow under the supervision of Scottish Aviation Ltd., deliveries commencing October 19, 1943 and ending on September 30, 1944. Earlier in the war seven Tiger Moths were also converted into Queen Bees and up to October 1942 the type was operated in Britain by T to Z Flights of No. 1 A.A.C.U. and by No. 2 A.A.C.U., Gosport which also supplied Queen Bees to ships of the Royal Navy. Nos. 3 and 4 A.A.C.U.s at Hal Far, Malta and Seletar, Singapore were similar overseas units. Being expendable, an unusually high number were held at Maintenance Units but after 1942 all reserves were held by the Pilotless Aircraft Unit at Manorbier.



As Queen Bees were only fitted with controls in the front cockpit, N2726A gave film cameramen a wide field of view from the rear seat. (J. M. G. Gradidge Photo.)

When the need for radio controlled target aircraft was over, a large number of Queen Bees were stored until declared obsolete on November 12, 1946 and scrapped. Most of the Glasgow-built machines were still at the P.A.U., Manorbier and 22 of these were sold to Rollason Aircraft Ltd. and 21 to other civilian contractors. Denuded of all serviceable Tiger Moth components, the fuselages were stored at Redhill for some years and then burned.

In 1986 one of the Glasgow-built Queen Bees, *LF858*, which had been stored at Old Warden for many years, was restored to flying condition as *G-BLUZ*. Prior to this the only Queen Bee known to have flown as a civil aeroplane was *N2726A*, the former *V4760*, c/n 5447, used by Pathé News in the U.S.A. in the 1950s. It was later owned by Hayward-Leland Productions Inc. of Burbank, California but in 1967 was acquired by J. M. Larsen for exhibition at the Aircraft Museum, Minneapolis.

SPECIFICATION AND DATA

Manufacturers: The de Havilland Aircraft Co. Ltd., Hatfield Aerodrome, Herts.
Scottish Aviation Ltd., at 39 Weir Campbell Street, Glasgow

Power Plant: One 130 h.p. de Havilland Gipsy Major 1

Dimensions: Span 29 ft. 4 in. Length 23 ft. 11 in.
Height 8 ft. 9½ in. Wing area 239 sq. ft.

Weights: All-up weight 1,825 lb.

Performance: Similar to D.H.82A Tiger Moth

Production:

(a) At Hatfield

Constructor's Numbers	Aircraft markings
5116	Indian Air Force
5027	<i>K3584</i> under A.M. Contract 232902/33
5038–5039	} <i>K3597–98</i> , <i>K4044–46</i> , <i>K4226–29</i> under A.M. Contract 262684/33
5044–5046	
5048–5051	
5089–5090	
5099	} <i>K4293–94</i> , <i>K4545</i> , <i>K5055</i> under A.M. Contract 295738/33 (<i>K5055</i> completed as Moth Major for the Indian Air Force)
5116	
5127–5128	<i>K5059–60</i> under A.M. Contract 370807/34
5134–5137	} <i>K5100–14</i> and <i>K5118</i> under A.M. Contract 388676/34
5153–5164	
5165–5206	<i>K8632–73</i> under A.M. Contract 463036/35 (<i>K8652</i> shot down by H.M.S. <i>Shropshire</i> 15.6.39; <i>K8668</i> crashed at Welwyn 16.12.36)
5207–5260	<i>L5888–5911</i> , <i>L7720–29</i> , <i>L7745–64</i> under A.M. Contract ITP694957/37
5261–5290	<i>N1818–47</i> under A.M. Contract ITP767330/38
5291–5428	<i>P4677–4716</i> , <i>P4747–81</i> , <i>P4788–4822</i> , <i>P5731–49</i> , <i>P5767–75</i> under A.M. Contract ITP962680/38
5429–5478	<i>V4742–72</i> , <i>V4787–4805</i> under A.M. Contract B55389/39

(b) At Glasgow

LF779–803; *LF816–839*; *LF857–867* under A.M. Contract 2398



D.H.82B Queen Bee *K4227*, c/n 5049, at the Farnborough demonstration on June 26, 1935.

(c) Tiger Moths converted to Queen Bees

N6722, *R5106*, *R5147*, *T6104*, *T6863*, *T6867*, *T7239*

Service Use:

Queen Bee Flight, No. 1 A.A.C.U., Watchett 7.37–3.40, first operational flight *K8661*; R.A.E., Farnborough, *K3584*, *K3598*, *K4044–46*, *K4226–27*, *K4294–95*, *K5060*, *K5100*, *K8640*; No. 1 Group Co-Operation Flight, Bawtry, *K8632–33*; No. 2 Aircrew Selection Unit, *K5095*

No. 1 A.A.C.U., 'T' Flt., Weybourne 1.41–4.42, *V4743*, *V4757*, first operational flight *V4760*/8.4.41; 'U' Flt., Morfa Towyn 11.40–10.42, first op. flt. *P4754*/19.4.41; 'V' Flt., Cleave 5.39–10.42 (to No. 1618 Flt. 11.42–11.43), *L7748*, *P4711*, *P5748*, first op. flt. *N1834*/13.7.39; 'W' Flt., Burrow Head 5.39–5.42 (to Kidsdale 10.39), first op. flt. *N1837*/7.6.39; 'X' Flt., Weybourne 5.39–10.42 (to Watchett 9.39, to Aberporth 9.40), *L5895*, *P4797*, first op. flt. *N1844*/6.6.39; 'Y' Flt., Manorbier 5.39–8.42 (to No. 1620 Flt. 11.42–11.43), *P4742*, *P4774*, *V4742*, *V4744*, *V4747*, *V4756*, first op. flt. 3.6.39; 'Z' Flt., Watchett 5.39–10.42 (to Aberffraw 10.40), *V4764*, *V4766*, first op. flt. *K8651*/3.6.39

No. 2 A.A.C.U., Gosport 3.37–1.43, *K8636*, *K8638–40*, *K8645–46*, *K8655*, *K8663*, *K8666*, *K8671*, *L5905–11*, *L7723*, *L7753–58*, *N1819–24*, *N1830–31*, *P4686–87*, *P4695*, *P5739–40*, *P5769–70*

No. 3 A.A.C.U., Hal Far, Malta 3.37–2.43 (to Gibraltar 9.39–11.40), *K5113–14*, *K5118*, *K8634–35*, *K8637*, *K8643–44*, *K8647*, *K8652–53*, *K8656–60*, *K8662*, *K8665*, *L7759*, *L7761–64*, *N1838–40*, *P4689*, *P4692–94*, *P4708*, *P4715*, *P5748*, *P4753*, *P4760*

No. 4 A.A.C.U., Seletar, Singapore 9.39–11.41, *L5901–04*, *L7720*, *L7722*, *L7724–26*, *N1832*; No. 24 (Training) Group, Henlow, *K8654*, *K8668*

Disposals: (a) Held at Pilotless Aircraft Unit, Manorbier 1945: *LF779–785*, *LF787–788*, *LF791–792*, *LF801*, *LF817*, *LF820*, *LF825–826*, *LF834–836*, *LF862*. (b) Sold to Rollason Aircraft Ltd.: *LF786*, *LF788*, *LF791*, *LF794*, *LF816*, *LF818–819*, *LF821*, *LF824*, *LF826–829*, *LF832*, *LF837–839*, *LF857*, *LF859–861*, *LF867*. (c) To other contractors: *LF789–790*, *LF792–793*, *LF795–803*, *LF822–823*, *LF830–831*, *LF833*, *LF858*, *LF863*



The Tiger Club's Fox Moth *G-ACEJ* and Puss Moth *G-AHLO* at Redhill in 1968.
(A. J. Jackson Photo.)

De Havilland D.H.83 Fox Moth

The early 1930s saw the establishment of short domestic and feeder airlines in all parts of the world on which a number of Puss Moths were used for want of a type more suited to the task. To meet the obvious requirement for something more roomy and economical, A. E. Hagg designed an aeroplane which would be not only cheap but have a useful performance while carrying the maximum possible payload on the power of one Gipsy III engine. The result was the Fox Moth, unquestionably the first British aeroplane, in the words of C. G. Grey, to support itself financially in the air. Low initial cost resulted from using standard Tiger Moth mainplanes, tail unit, undercarriage and engine mounting, the only new major component being the fuselage. This marked a return to de Havilland's time honoured spruce and plywood construction with accommodation for four passengers in an enclosed cabin with the pilot in an open cockpit aft, D.H.50 fashion. On short pleasure flights it would carry five adults on a mere 120 h.p., an astonishing feat of weight lifting which has seldom been equalled. If extra fuel was carried in place of the fourth passenger, a range of 360 miles was possible.

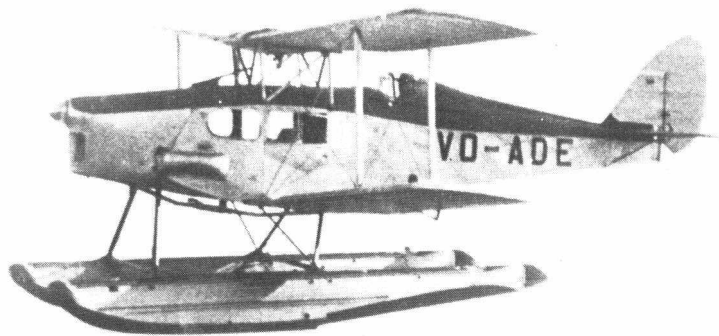
G-ABUO, the prototype, first flown at Stag Lane on January 29, 1932 was shipped to Canada and evaluated on floats and skis by Canadian Airways Ltd. So sturdy was the design that it flew as *CF-API* for nearly 20 years, ending its useful life with Leavens Bros. at Toronto in 1950. It was forerunner of seven Fox Moths erected at Downsview from British built components. A total of 98 Fox Moths was built, all except the prototype having narrow chord steel tubular interplane struts. They were allocated the 4000 block of constructor's numbers and 49 were of British

registry. Three early examples, *G-ABVI*, *'VJ* and *'VK*, ousted the Puss Moths from the Clacton-Maylands-Ramsgate scheduled service of Hillmans Airways Ltd. in June 1932 and a month later W. L. Hope averaged 124.13 m.p.h. to win his third King's Cup in the second production aircraft *G-ABUT*. This had been modified for racing with a 130 h.p. Gipsy IIIA (later Gipsy Major) engine, sliding cockpit canopy and a fuel tank in the cabin instead of the centre section. The majority of production Fox Moths had Gipsy Major engines and about one-third had sliding hoods. These were occasionally referred to as the 'Speed Model' but there was no change of designation.

The Prince of Wales, already the owner of Puss Moths, acquired a very handsome red, blue and chromium Fox Moth *G-ACDD* early in 1933, but the acquisition of a Dragon resulted in its sale to a prominent Belgian private owner Guy Hansez as *OO-ENC* for participation in the Egyptian International Air Rally in December of that year. He also made a fast return flight to the Congo in 1934 and in 1935 it went to Air Travel (N.Z.) Ltd. as *ZK-AEK*, to join several other Fox Moths on the pioneer 135 mile air mail service down the west coast of South Island from Hokitika to Okuru. The Fox Moth also inaugurated serious air transport in Scotland when, in 1933, the Scottish Motor Traction Co. Ltd. and Midland and Scottish Air Ferries Ltd., both of Renfrew, bought eight and four machines respectively for frequent services to, and occasional joyriding at, the remote townships in the Highlands and the Hebrides. In the south, *G-ACEB* pioneered the Thames air ferry between Southend and Rochester in 1934 and for six years *G-ACCA* and *'IG* worked the Portsmouth-Ryde holiday service of Portsmouth, Southsea and Isle of Wight Aviation Ltd. In the joyriding field *G-ACEX* "Youth of Ireland" and *'EY* "Youth of Newfoundland" toured with National Aviation Day Displays and at Blackpool, West Coast Air Services Ltd. catered for holiday makers with *G-ACFC* "Progress I" and *'FF* "Progress II" but loaned them to Olley



The prototype Fox Moth in Canada in 1932 with sliding cockpit canopy and ski undercarriage.



An Imperial Airways Fox Moth, *VO-ADE*, c/n 4094, on Fairchild floats in Newfoundland in 1935. (*Imperial Airways Photo.*)

Air Service Ltd. at Croydon during the flat racing season for the conveyance of jockeys and the Press. Two others, *G-ACCB* and *'EJ* were acquired by the Giro Aviation Co. Ltd. of Southport, where a quarter of a century later, *'EJ* was still joyriding on the sands. In 1966 it was sold to the Tiger Club.

After the 1932 King's Cup success, spectacular Fox Moth flights were few but on February 16, 1933 Lord Clydesdale left Heston to fly *G-ACCS* to India to act as air taxi for the British Everest Flight Expedition. Another Fox Moth *'RU* was taken to Graham Land by the British Graham Land Expedition and flew 104 hours in three years as a sea and skiplane on survey work piloted by W. E. Hampton. Yet another, *'RK*, left Rochester piloted by John Grierson on July 20, 1934 to make an outstanding seaplane flight to Iceland and over the Greenland Ice Cap to Ottawa, reached in 61 hours flying time on August 30th. H. F. Broadbent came eighth in the 1934 King's Cup Race at 121.03 m.p.h. in a 'Speed Model' *G-ACSW* originally ordered for the MacRobertson Race to Australia. It was later sold in India where Tata Airlines were using Fox Moths *VT-ADZ* and *'FI* with conspicuous success on their Bombay-Karachi route. Two others, including *VT-AFB*, were used in 1937 on the Indian National Airways route from Karachi to Lahore, while in Burma *VT-AFZ* was operated on floats by the Irrawaddy Flotilla Co. Ltd. for services between Rangoon-Yenangyaung and Moulmein-Tavoy. Fox Moths *VO-ABC* and *'DE* on Fairchild floats were used by Imperial Airways Ltd. from July 1935 for meteorological flights over Newfoundland, using moorings in Portugal Cove, St. Johns.

Five Fox Moths were added to the D.H.60Ts at the Brazilian School of Naval Aviation as navigation trainers and two others, *SU-ABA* and *'BG* plied between Cairo and Alexandria on Misr Airwork's first scheduled service. Others found employment in South Africa and also farther north where Rhodesia and Nyasaland Airways Ltd. added *VP-YAD* and *'AK* to its fleet for local services radiating from Salisbury and excursion trips

to Beria on the coast. In Tasmania the Fox Moth "Miss Currie" flown by Victor Holyman, opened the 108 mile Launceston-Flinders Island service in September 1932. QANTAS also purchased five to replace the veteran D.H.50s of the Flying Doctor service and 30 years later a sixth, *VH-USJ*, was still in use by the Western Australia section. Others found their way to the New Guinea goldfield service for which they were ideally suited. At least two Fox Moths were built at Sydney by de Havilland Aircraft Pty. Ltd., one of which, later re-registered *VH-GAS*, saw service with Papuan Air Transport Ltd. at Port Moresby. A copy, registered *J-BBJI* and known as the Chidorigo, was also built in Japan by the Tokyo Gas and Electric Industry Co. It was powered by a 150 h.p. 7 cylinder radial similar to the Armstrong Siddeley Mongoose and named the Gasden Zimpu. The Chidorigo was used for taxi and joyriding work by the Japan Aerial Transport Co. which also owned four genuine British-built Fox Moths.

During the war years Fox Moths in Britain were camouflaged and impressed, three for Air Transport Auxiliary, three for a radar trials unit at Christchurch and one each to the Royal Navy and the Blackburn company as hacks. Four were impressed by the R.A.A.F. as well as a number by the R.N.Z.A.F. and after the war several were still flying in Britain, Australia, New Zealand, Canada and Spain. The Spanish aircraft, then registered *EC-AEI*, was originally the floatplane *EC-VVA* delivered in April 1934 which served with the Air Force as 30-147.

In 1946 a demand from Canadian bush fliers led to the establishment of a production line at Downsview for an entirely Canadian-built Fox Moth designated D.H.83C. This was produced relatively cheaply using war surplus D.H.82C Tiger Moth components. Powered by a 145 h.p. Gipsy Major 1C and carrying a maximum of only three passengers, the D.H.83C had a cruising speed of 96 m.p.h. and a still air range of 375 miles. The cabin area was strengthened locally and the door on the port side was enlarged rearwards to facilitate the loading of bulky freight



A Canadian-built D.H.83C Fox Moth *G-AOJH*, c/n FM.42, showing the enlarged Plexiglas coupé top. (*A. J. Jackson Photo.*)

or stretchers, and the cockpit opening was widened and covered by a sliding coupé top of new design. A crash pylon, brakes and the D.H.82C tail wheel were fitted as standard. Mining, exploration and transport companies all over Canada seized upon the wheel, float or ski equipped D.H.83C as an indispensable maid-of-all-work pending the delivery of new postwar designs, and 52 were built before Downsview turned entirely to Chipmunk production. The new Fox Moths were also used by such firms as Newfoundland Airways (*CF-BNM*), Central British Columbia Airways (*CF-DIQ*), the Saskatchewan Department of Natural Development (*CF-SAL*), and the Photographic Survey Co. Ltd. (*CF-DJG*). Sixteen were exported, *VP-RAY* to Zambesi Airways in Southern Rhodesia, seven to Pakistan for private owners and the Northern India, East Pakistan and Karachi Aero Clubs, three to New Zealand for the Marlborough and Auckland Clubs, and four to Nalanda Airways Ltd., Patna, India. The last two sets of components were handed over for completion by Leavens Bros. Ltd. but only one, the 54th machine *CF-EVK*, actually flew. *AP-ABO*, one of the Pakistanis, landed at Southend on September 24, 1955 after an unpublicised ferrying flight from Karachi and three years later the Canadian C. of A. was validated after overhaul at Sherburn-in-Elmet. In 1987 it was still used for joy-riding, based at Hurn by owner J. S. Lewery as *G-AOJH*. Also airworthy was the last British-built Fox Moth, *ZK-ADI* immaculately restored for B. D. Woodford by the Aeroplane Company (Hamble) Ltd. in 1985, registered *G-ADHA*, and finished to represent the Prince of Wales' *G-ACDD*.

SPECIFICATION AND DATA

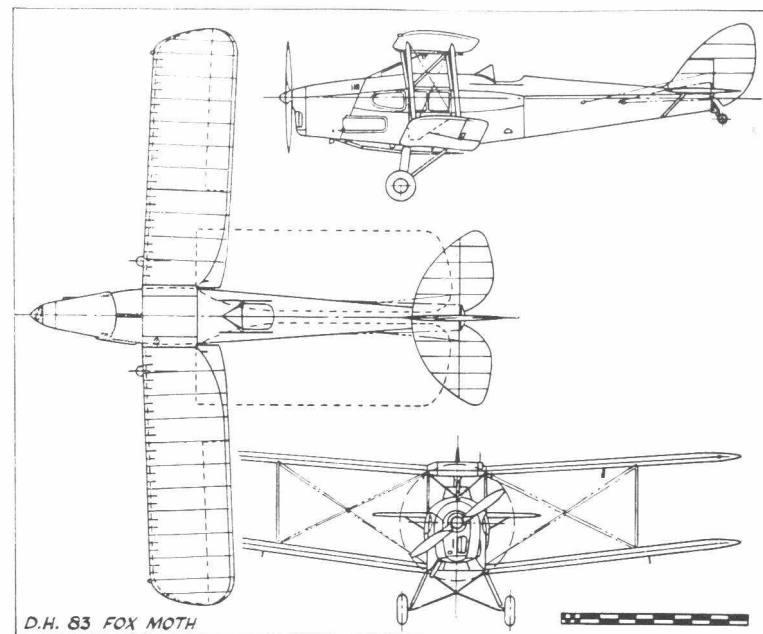
Manufacturers: The de Havilland Aircraft Co. Ltd., Stag Lane Aerodrome, Edgware, Middlesex. Works transferred to Hatfield Aerodrome, Herts. in 1934 de Havilland Aircraft Pty. Ltd., Bankstown Aerodrome, Sydney, N.S.W. de Havilland Aircraft of Canada Ltd., Downsview Aerodrome, Toronto

Power Plants: One 120 h.p. de Havilland Gipsy III
One 130 h.p. de Havilland Gipsy Major
One 145 h.p. de Havilland Gipsy Major 1C

Dimensions: Span 30 ft. 10½ in. Length 25 ft. 9 in. (Seaplane) 26 ft. 9 in.
Height 8 ft. 9½ in. Wing area 261½ sq. ft.

Weights and Performances:

	D.H.83		D.H.83C		
	Gipsy III	Gipsy Major	Landplane	Skiplane	Seaplane
Tare weight	1,071 lb.	1,100 lb.	1,219 lb.	1,258 lb.	1,444 lb.
All-up weight	2,000 lb.	2,070 lb.	2,100 lb.	2,100 lb.	2,300 lb.
Maximum speed	106 m.p.h.	123 m.p.h.	110 m.p.h.	108 m.p.h.	96 m.p.h.
Cruising speed	91 m.p.h.	105 m.p.h.	96 m.p.h.	94 m.p.h.	84 m.p.h.
Initial climb	450 ft./min.	605 ft./min.	525 ft./min.	510 ft./min.	450 ft./min.
Ceiling	12,700 ft.	15,000 ft.	12,300 ft.	12,000 ft.	11,000 ft.
Range	425 miles	415 miles	375 miles	368 miles	328 miles



Production:
(a) **British**

Constructor's Numbers	Aircraft markings
4000-4025	<i>G-ABUO</i> , 'UP', 'UT', <i>EI-AAP</i> , <i>G-ABVI</i> , 'VK', 'VJ', 'WB', 'WF', 'WD', <i>VH-UQM</i> , <i>CF-ATV</i> , <i>G-ABYO</i> , Japan, <i>G-ABZA</i> , 'XS', Japan, <i>G-ABYR</i> , 'ZM', <i>VH-UQS</i> , 'QP', 'QQ', <i>G-ABZN</i> , <i>ZS-ADH</i> , <i>SU-ABG</i> , <i>ZK-ADC</i>
4026-4050	<i>G-ABZD</i> , Brazilian Navy (5), <i>VT-ADZ</i> , <i>G-ACDD</i> , <i>VP-YAD</i> , 'AK', <i>G-ACBO</i> , <i>CF-APF</i> , 'PG', <i>D-3408</i> , <i>G-ACBZ</i> , 'CA', 'CB', <i>VT-AEA</i> , <i>G-ACCS</i> , <i>VT-AEB</i> , <i>G-ACCF</i> , 'CT', 'CU', <i>CF-ATX</i> , <i>CF-APH</i>
4051-4076	<i>VH-UQU</i> , <i>CF-APO</i> , <i>G-ACFC</i> , 'DZ', 'EA', 'EX', 'EY', 'EB', 'EC', 'FF', Austrian <i>A-129</i> , <i>G-ACGB</i> , 'GN', 'ED', 'EE', <i>EC-AVA</i> , <i>G-ACGW</i> , 'EI', 'EJ', Eagle Oil, <i>VT-AEJ</i> , <i>G-ACIG</i> , <i>EC-WJ9</i> to <i>EC-W22</i>
4077-4097	<i>G-ACIY</i> , <i>VT-AEM</i> , Japan (2), <i>VT-AEN</i> , 'EQ', <i>G-ACKZ</i> , <i>VH-URI</i> , <i>ZK-ADH</i> , <i>VT-AFB</i> , <i>EC-W23</i> , <i>VT-AFI</i> , <i>G-ACRU</i> , 'RK', 'SW', <i>VT-AFZ</i> , <i>VO-ABC</i> , 'DE', <i>CF-AVE</i> , <i>VH-USL</i> , <i>ZK-ADI</i>

(b) **Australian**

DHA.5-6	<i>VH-UZS</i> , <i>VH-AAA</i> (later <i>VH-GAS</i>)
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(c) **Canadian**

FM.1-16	<i>CF-BFI</i> , 'NI', 'NK-NQ', 'NH', 'NR', 'NS', 'NV-NY
FM.17-40	<i>CF-DIQ</i> , 'IR' (later <i>VT-CLS</i>), <i>CF-DIS</i> -IU, 'IW', 'IV', 'IX-JC', <i>CF-SAL</i> , <i>CF-DJE</i> , 'JG', 'JF' (later <i>VP-RAY</i>), <i>CF-DJD</i> , 'JJ-JL', <i>CF-EXW</i> , <i>CF-DJM</i> (later <i>VT-CLT</i>), <i>CF-DJN</i>
FM.41-54	<i>AP-ABN</i> -BS, 'AM', <i>ZK-APT</i> , 'QB', 'QM', <i>VT-CLU</i> , 'LV', <i>ZK-ARQ</i> not built, <i>CF-EVK</i>



Hillman's Airways Dragon 1, G-ACBW "Gidea Park", Fleet No. 9, flying near Maylands, Romford, in 1933.

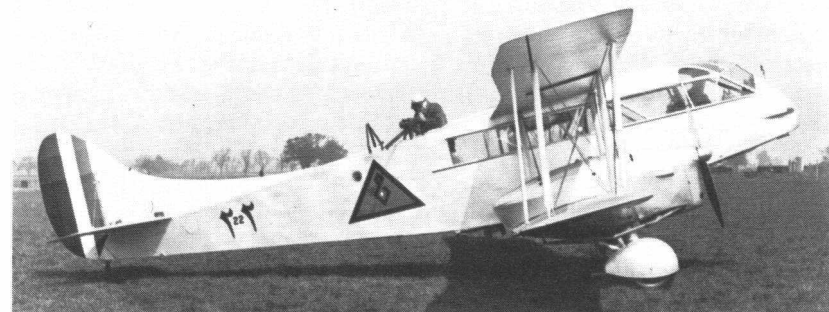
De Havilland D.H.84 Dragon

The success of his internal Fox Moth services prompted Edward Hillman to ask de Havillands for a twin engined version with which to operate to Paris at cut prices. A request for a machine of this description had already come from the Iraqi Air Force and when shown A. E. Hagg's designs, Hillman ordered four straight from the drawing board. It was a high aspect ratio, two bay biplane known as the Dragon, accommodating six passengers in reasonable comfort in a well glazed spruce and plywood fuselage. The single pilot occupied a nose compartment affording a magnificent view in all directions and reached via a door in the front cabin bulkhead. Two Gipsy Major engines were housed in neat nacelles on the lower mainplane beyond which standard Gipsy Moth mainplanes with tapered ailerons were rigged as folding outboard panels. The prototype Dragon, E-9, first flown at Stag Lane by H. S. Broad on November 24, 1932 was delivered to Maylands Aerodrome, Romford in Hillman's blue and white livery as G-ACAN in the following month. On test, Dragon economics were found to surpass even those of the Fox Moth, cruising speed being 109 m.p.h. with six passengers and 45 lb. of luggage each for an hourly petrol consumption of only 13 gallons. The rest of the order, G-ACAO, 'AP and 'BW, were delivered in time for the opening of the cross Channel service in April 1933 but the Hillman fare structure attracted so much traffic that 'EU and 'EV were added to the fleet, all six being converted to eight seaters by the removal of the rear luggage compartment.

Orders from other small airlines soon necessitated a production line to which was assigned the 6000 block of constructor's numbers and in the

next three years, 115 were sold in all parts of the world. Eight D.H.84M military Dragons delivered to the Iraqi Air Force in Baghdad on May 13, 1933 for patrol duties and the suppression of local risings, carried sixteen 20 lb. bombs and were equipped with two guns in the nose and a mid-upper gun position at the rear of the cabin. A guard rail was fitted to prevent the tail being shot away and unlike civil Dragons, they boasted long curving dorsal fins. Five more military Dragons were delivered, S.21 and S.22 to the Danish Army Air Force in March 1934 and a trio of aircraft from the end of the production line to the Portuguese Air Force in 1937. The Eirann Army Air Corps and the Turkish Air Force acquired one and two Dragons respectively but these were secondhand civil machines specially modified to their requirements.

In 1933 Dragons were used by Midland and Scottish Air Ferries Ltd. to open scheduled services, and for charters by the Scottish Motor Traction Co. Ltd. with one aircraft kept at permanent readiness for ambulance trips to the Western Isles. Northern and Scottish Airways Ltd., founded with one Dragon, worked between Renfrew, Campbelltown, Islay and the Outer Hebrides; Aberdeen Airways Ltd. operated from Dyce with three; and Highland Airways Ltd., which owned four, inaugurated its service between Dyce and Orkney with G-ACIT on May 7, 1934. Overseas orders included one Dragon ferried to Automobiles Fernandez of Barcelona as EC-W14 (later EC-TAT), and three shipped to Canada, the first of which, CF-APJ, bought by Canadian Airways Ltd. in 1933, carried the mail between Moncton, N.B. and Charlottetown, P.E.I. for ten years. Other examples were G-ACKC and 'KD which replaced the ancient D.H.50 on the pipeline patrol of the Iraq Petroleum Transport Co. Ltd.; ZS-AEF, 'EG and 'EH erected at Baragwanath for African Air Transport Ltd.; VT-AEK and 'EL which left Heston on delivery to Indian National Airways Ltd. on November 2, 1933; G-ACIE/OK-ATO used for executive travel by the Bata Shoe Company in Czechoslovakia; SU-ABH, 'BI and 'BJ flown to Egypt for the extension of the routes of Misr Airwork, and VP-KAW and 'BA acquired by Wilson Airways Ltd., Nairobi, for a service to



Iraqi Air Force D.H.84M Dragon serial 22, c/n 6012, showing the mid upper gun position and dorsal fin. ('Flight' Photo 13002.)



The veteran Dragon 1 *G-ACIT* "Orcadian" with which Capt. E. E. Fresson opened the Highland Airways Aberdeen–Orkney service in 1933, photographed near Old Warden just 40 years later. (*Air Portraits*.)

Mombasa, Zanzibar and Dar-es-Salaam.

A few Dragons were privately owned; W. L. Everard had *G-ACEK* "Leicestershire Vixen II", *F-ANES* was used for this purpose in Morocco, M. Jean Germain and family of Algiers circumnavigated Africa in 27 days in *F-AMTN*, 'TR and 'UZ, and the Prince of Wales acquired a V.I.P. four seater *G-ACGG*. Jim and Amy Mollison's special Dragon *G-ACCV* "Seafarer" was equipped with cabin fuel tanks and strengthened undercarriage for an attempt on the world's long distance record. While taxiing out at Croydon on June 8, 1933 to take off for New York, starting point of their intended nonstop flight to Baghdad, the undercarriage collapsed, but after repairs they successfully got away from Pendine Sands, South Wales on July 22nd. Thirty-nine hours later they arrived over Bridgeport, Connecticut, but through fatigue and darkness landed down wind and turned over. Engines and special tanks were salvaged and built into a successor, *G-ACJM* "Seafarer II", shipped to Canada in the following September through the generosity of Lord Wakefield. After three unsuccessful take off attempts at the maximum permissible weight of 7,334 lb. at Wasaga Beach, Ontario on October 3rd, the Baghdad flight was abandoned and the aircraft sold to would-be record breakers J. R. Ayling and L. Reid. Renamed "Trail of the Caribou" it took off successfully on August 8, 1934 but excessive fuel consumption resulted in a landing at Heston 30 hours 50 minutes later at the end of the first nonstop flight from the Canadian mainland to Britain.

Commencing with the sixty-third aircraft, *G-ACMO* for Jersey Airways Ltd., an improved version known as the Dragon 2 came off the production line with individually framed windows and faired-in undercarriage struts. First of the new model to fly was the sixty-seventh aircraft *G-ACKU*,

built for W. L. Everard in November 1933 and flown to victory in the Oases Circuit Race in Egypt by W. D. Macpherson a month later. Seventy Dragons used on British internal airlines included thirty-one Mk. 2 aircraft, the principal operator being Jersey Airways Ltd. founded by W. L. Thurgood, proprietor of the People's Motor Services Ltd., Ware. Taking delivery of his first Dragon 2 *G-ACMJ* at Stag Lane on December 15, 1933, he made a storm tossed proving flight to Jersey via Portsmouth, piloted by W. B. Caldwell who made the first landing on the sands at St. Aubins Bay which had given the aircraft its name. It was one of eight brand new Dragon 2s which carried 19,761 passengers on the high density shuttle between Heston and the Jersey beaches during 1934.

A similar fleet, *G-ACHV*, 'PX, 'PY, 'VD, 'XI, *G-ADED*, 'EE, 'DI "City of Cardiff" (renamed "Island Maid" in 1938) and 'DJ "City of Plymouth", was used by Railway Air Services Ltd. over the Liverpool–Birmingham–Cardiff–Plymouth and Birmingham–Bristol–Isle of Wight network.

Dragons were invaluable on over-water journeys ranging from 5 minute trips on the Portsmouth–Ryde ferry or the short Weston-super-Mare–Cardiff link of Western Airways Ltd. to the Squires Gate–Isle of Man service of Blackpool and West Coast Air Services Ltd. In the remote areas of the Commonwealth they were the ideal work horses, early examples being *VH-URF* and 'RG equipped with Williamson cameras for photographic survey work by the Western Mining Corporation of Australia in the Kalgoorlie goldfields. Three others *VH-URW*–'RY flew the 2,252 mile Perth–Daly Waters route of MacRobertson–Miller Aviation Co. Ltd. and sister aircraft operated with Butler Aviation Ltd. over the Charleville–Cootamundra section of the England–Australia air mail. East Coast Airways Ltd. became the first New Zealand operator of twin engined equipment when it imported *ZK-ADS* and 'ER for a four times daily Napier–Gisborne service opened on April 15, 1935. *CF-AVD*, one of several Dragons used in Canada, was fitted with twin metal floats and



Jim and Amy Mollison's long range Dragon 1 "Seafarer", c/n 6014. (*The Aeroplane* Photo.)



CF-AVD, c/n 6086, showing the framed windows of the Dragon 2 and the twin float undercarriage designed by the Canadian Fairchild company.

the compensatory curved dorsal fin of the D.H.84M.

Farther south in Brazil, Viacao Aerea de Sao Paulo S.A. (VASP) added to its fleet the Dragon 2 *PP-SPC* which de Havilland's South American representative W. T. Ballantyne had flown across the South Atlantic with his wife as passenger. Another noteworthy example was the flying show-room of Smiths Aircraft Instruments Ltd., first flown under B conditions as *E-4* in October 1935 and later well known all over Europe as *G-ADOS*.

The Dragon 2 *EI-ABI* "Iolar" (Eagle) was the aircraft with which Aer Lingus inaugurated its first daily return service between Dublin and Bristol on May 27, 1936, the year when a fleet of Dragons was in constant use on early morning newspaper flights between Croydon and the Continent. From 1937 they were used mainly on Army Co-Operation night flying contracts and between April–October 1940, seventeen were impressed. The former Surrey Flying Services' *G-ACIU* was abandoned at Mourmelon, France as *X9395* in April 1940 but the remainder were used for training parachute troops at Nos. 6 and 7 A.A.C.U.s at Ringway and Castle Bromwich. Five continued as camouflaged civil aircraft in Scotland and on the Lands End–Scillies service of Channel Air Ferries Ltd. until the former "Iolar", *G-ACPY*, was shot down by a German fighter on June 3, 1941. *G-ACIT* and *DI* survived the war and resumed commercial flying for the Air Navigation and Trading Co. Ltd., taking sightseers round Blackpool tower. *G-AECZ*, another war survivor, went to Eire as *EI-AFK* to become an air taxi with Weston Ltd. at Leixlip. This was the machine that was restored to flying condition in 1986, and officially registered *EI-ABI*, by Aer Lingus to commemorate the 50th anniversary of the airline's first service.

An urgent requirement for radio and navigation trainers in Australia was met very neatly during the Second World War when de Havilland Aircraft Pty. Ltd. built a second generation of Dragons at Bankstown, using drawings and the surviving jigs shipped out from Hatfield. The Dragon was preferred to the Rapide because Gipsy Major engines were readily obtainable from General Motors Holdens Ltd. who were building

them in Melbourne for the Australian Tiger Moth contract. *A34-12*, first flown on September 29, 1942, was the first of 87 delivered to the R.A.A.F. between October 1942 and June 1943 to supplement eleven impressed Dragons. They were strictly utility aircraft with unframed windows similar to the British Mk. 1. Those remaining after the war were put up for disposal in 1946–7, when 46 were registered to Australian charter companies. Seventeen of these were in use until the mid-1960s including *VH-AON*, *QW* and *RJ* in New Guinea with Territory Airlines Ltd., Madang Air Services Ltd. and Mandated Airlines Ltd. respectively; *VH-AMN* and *SU*, based on Cheltenham, Vic., for crop spraying with Schutt Airfarmers Pty. Ltd.; *VH-AQU* operating with Marshall Airways at Bankstown and *VH-PSZ* was the pride of the Royal Aero Club of New South Wales. A single specimen was also shipped to New Zealand where it was used for taxi work by the Nelson Aero Club as *ZK-AXI* and then by the Auckland Flying School until pensioned off and presented to the local Museum of Transport in 1967. Another, *A34-92*, intended for joyriding at Butlin's holiday camps in Britain as *G-AJKF*, was never imported.

G-ADDI became a familiar sight at holiday resorts and air displays from 1963 onwards in Chrisair colours and usually flown by Mrs. Claire Roberts who carried 2,500 pleasure flight and charter passengers in the first year. On February 21, 1971 it was flown to Rotterdam as *N34DH* for shipment to the Perlitch Transportation Museum, Morgan Hill, California. *G-ACIT*, which had been acquired by Beagle Aircraft Ltd. in 1962 for executive use, was delivered to the Southend Historic Aircraft Museum as an air-worthy exhibit on September 19, 1971. It was acquired by the Science Museum in 1983.

One of the last Dragons to fly in Australia was the second Bankstown-built example *VH-SNB* "White Wings", formerly *A34-13* and *VH-ASK*, which from 1962 to 1967 was used by the Les Nixon Evangelistic Association on mission work between Darwin–Perth and Portland–Derby. After six years in store at Camden, N.S.W., it was sold to Sir William Roberts



Dragon navigation trainers built in Australia during the Second World War were provided with greatly enlarged windows. This example, *VH-AYZ*, formerly *A34-64*, was owned by E. D. Hill of Wyandra, Queensland in 1961.

and shipped to Scotland to join the Strathallan Aircraft Collection. It is now in the Museum of Flight at East Fortune.

SPECIFICATION AND DATA

Manufacturers: The de Havilland Aircraft Co. Ltd., Stag Lane Aerodrome, Edgware, Middlesex. Works transferred to Hatfield Aerodrome, Herts. in 1934
de Havilland Aircraft Pty. Ltd., Bankstown Aerodrome, Sydney, N.S.W.

Power Plants: Two 130 h.p. de Havilland Gipsy Major 1

Dimensions: Span 47 ft. 4 in. Length 34 ft. 6 in. (Seaplane) 36 ft. 6 in.
Height 10 ft. 1 in. Wing area 376 sq. ft.

Weights and Performances:

	Dragon 1	Dragon 2	
		Landplane	Seaplane
Tare weight . . .	2,300 lb.*	2,336 lb.	2,795 lb.
All-up weight . . .	4,200 lb.	4,500 lb.	4,500 lb.
Maximum speed . . .	128 m.p.h.	134 m.p.h.	120 m.p.h.
Cruising speed . . .	109 m.p.h.	114 m.p.h.	95 m.p.h.
Initial climb . . .	612 ft./min.	565 ft./min.	500 ft./min.
Ceiling . . .	12,500 ft.	14,500 ft.	—
Range . . .	460 miles	545 miles	—

* Unfurnished prototype 2,161 lb. for Martlesham trials.

Production:

(a) British Mk. 1

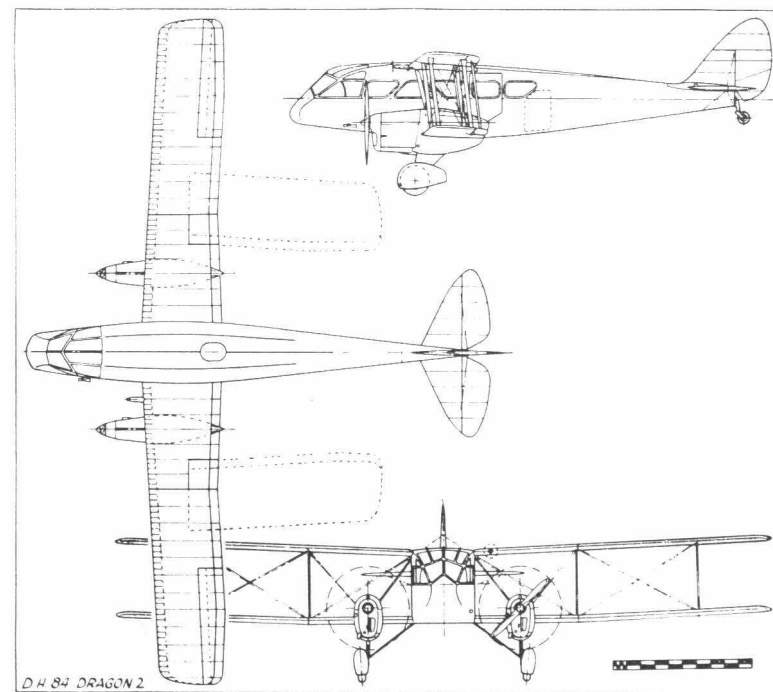
Constructor's Numbers	Aircraft markings
6000–6025	<i>G-ACAN</i> – <i>'AP</i> , Iraq Nos. 16–21, <i>G-ACBW</i> , <i>'CE</i> , <i>'CR</i> , Iraq Nos. 22–23, <i>G-ACCV</i> , <i>'CZ</i> , <i>'DL</i> – <i>'DN</i> , <i>'EK</i> , <i>EC-W14</i> , <i>G-ACET</i> – <i>'EV</i> , <i>CF-API</i> , <i>G-ACGG</i>
6026–6050	<i>ZS-AEF</i> , <i>G-ACFG</i> , <i>SU-ABH</i> , <i>VH-URE</i> , <i>ZS-AEG</i> , <i>SU-ABI</i> , <i>G-ACIE</i> , <i>'GK</i> , <i>'GU</i> , <i>'HV</i> , <i>'HX</i> , <i>VH-URD</i> , <i>G-ACIW</i> , <i>'IT</i> , <i>'JH</i> , <i>'JU</i> , <i>'JS</i> , <i>'JT</i> , <i>YI-AAC</i> , <i>VH-URF</i> , <i>'RG</i> , <i>VP-KAW</i> , <i>VT-AEL</i> , <i>G-ACJM</i> , <i>VT-AEK</i>
6051–6061	<i>SU-ABJ</i> , <i>G-ACKD</i> , <i>'MC</i> , <i>ZS-AEH</i> , <i>G-ACKB</i> , <i>'KC</i> , <i>'LP</i> , <i>'MJ</i> , <i>VP-KBA</i> , Danish <i>S.21</i> , <i>S.22</i>

(b) British Mk. 2

6062–6075	<i>G-ACMO</i> , <i>'MP</i> , <i>F-AMUZ</i> , <i>VT-AES</i> , <i>G-ACKU</i> , <i>'NA</i> , <i>VH-URO</i> , <i>G-ACNG</i> – <i>'NJ</i> , <i>'OR</i> , <i>VH-USA</i> , <i>G-ACPX</i>
6076–6100	<i>G-ACPY</i> , <i>'RF</i> , <i>'RH</i> , <i>'RO</i> , <i>VH-URW</i> – <i>'RY</i> , <i>F-ANES</i> , <i>G-ACVD</i> , <i>PP-SPC</i> , <i>CF-AVD</i> , <i>G-ACXI</i> , <i>VH-URU</i> , <i>'RV</i> , <i>ZK-AER</i> , <i>'DS</i> , <i>G-ADCP</i> , <i>CF-AVI</i> , <i>G-ADCR</i> , <i>'CT</i> , <i>'DI</i> , <i>'DJ</i> , <i>'ED</i> , <i>'EE</i> , <i>'FI</i>
6101–6114	<i>OE-FKD</i> , <i>VH-UVB</i> , <i>G-ADOS</i> , <i>VH-UTX</i> , <i>G-AECZ</i> , <i>'FX</i> , <i>'IS</i> – <i>'IU</i> , <i>'MI</i> , <i>'MJ</i> (to Portuguese Air Force), <i>G-AEMK</i> , Portuguese Air Force (2)

(c) Australian

Constructor's Numbers	Aircraft markings
2001–2020	<i>A34-12</i> to <i>A34-31</i> Civil conversions: 2002 <i>VH-ASK</i> , 2006 <i>'OS</i> , 2010 <i>'OP</i> , 2011 <i>'OQ</i> , 2017 <i>'GI</i> , 2019 <i>'ON</i> , 2020 <i>'SL</i>
2021–2040	<i>A34-32</i> to <i>A34-51</i> Civil conversions: 2022–2024 <i>VH-ALL</i> , <i>'MB</i> , <i>'FK</i> ; 2027 <i>VH-BAF</i> , 2029 <i>VH-ARI</i> , 2031 <i>'YM</i> , 2039 <i>'SX</i>
2041–2060	<i>A34-52</i> to <i>A34-71</i> Civil conversions: 2042 <i>VH-AOR</i> , 2044–2046 <i>VH-BJH</i> , <i>VH-ASO</i> , <i>'GJ</i> ; 2048–2051 <i>VH-AQU</i> , <i>VH-BMX</i> , <i>VH-AOT</i> , <i>'PL</i> ; 2053 <i>'YZ</i> ; 2055–2059 <i>VH-BAH</i> , <i>VH-AOK</i> , <i>'EF</i> (later <i>ZK-AXI</i>), <i>'OE</i> , <i>'MN</i>
2061–2080	<i>A34-72</i> to <i>A34-91</i> Civil conversions: 2061 <i>VH-AKX</i> , 2063–2068 <i>VH-BDB</i> , <i>VH-APJ</i> , <i>'YB</i> , <i>'OM</i> , <i>'MO</i> , <i>'QW</i> ; 2071–2074 <i>VH-AXL</i> , <i>'PP</i> , <i>'HY</i> , <i>'VU</i> ; 2079–2080 <i>VH-ASU</i> , <i>'RJ</i>
2081–2087	<i>A34-92</i> to <i>A34-98</i> Civil conversions: 2081–2086 <i>VH-BDS</i> , <i>VH-AGM</i> , <i>VH-BDC</i> , <i>VH-AOL</i> , <i>'FH</i> , <i>'IA</i>





M. Jean Laurencia's D.H.85 Leopard Moth *OO-NAD*, c/n 7031, was one of the original aircraft with flat sided fuselage. ('*The Aeroplane*' Photo.)

De Havilland D.H.85 Leopard Moth

The Leopard Moth was a full three seater designed for luxury private travel in 1933 as a successor to the Puss Moth and incorporating refinements made possible by the use of the higher powered Gipsy Major engine. A considerable saving in structural weight was also effected by abandoning the welded steel fuselage in favour of a spruce-and-plywood box structure in which the pilot was seated centrally in front of two side by side passengers. Major external differences between the Leopard Moth and its predecessor included a folding mainplane with swept back leading edge forming a tapered wing; an externally braced and adjustable tail-plane; and main undercarriage legs which were anchored to the rear of the engine mounting instead of to the top longerons. This permitted wider opening of the door for easier access to the cabin. Bendix wheel brakes were also fitted and the undercarriage shock leg fairings could be rotated through 90 degrees, Puss Moth fashion, to form an air brake which steepened the gliding angle from 1 in 12 to 1 in 9.

Piloted by Capt. Geoffrey de Havilland and bearing the Class B marking *E-1*, the prototype *G-ACHD* made its first flight at Stag Lane on May 27, 1933. It was 4 m.p.h. up on estimate and 9 m.p.h. faster than the Puss Moth. Six weeks later on July 8th, with mass instead of the original horn balanced ailerons, it carried 'D.H.' to victory in the King's Cup Race at Hatfield, averaging 139.51 m.p.h. to make fastest time. For a new type this was spectacular publicity indeed, even without A. J. 'Bill' Styrant's seizure of third place in the third production aircraft '*HC*' at 138.5 m.p.h. and Mrs. A. S. Butler in sixth place in '*HB*'. Orders came from all parts of the world and the 7000 series of constructor's numbers was allotted to the production line at Stag Lane. The works was transferred to Hatfield when the old aerodrome closed on January 5, 1934 and in three years 132 Leopard Moths were built, 71 of which were sold

on the home market. The first 30 aircraft had flat sided fuselages but thereafter a slightly rounded effect was obtained by means of a fabric covering stretched over external wooden stringers. The type was immensely popular with private owners such as Nigel Norman, founder of Heston Airport, who secured the registration *G-ACNN* featuring his initials and applied it to the Leopard Moth in large chromium plated letters; W. L. Everard whose *G-ACKM* was named "The Leicestershire Fox III"; Capt. Geoffrey de Havilland who acquired the 20th production aircraft '*KP*' for his own use, and many other well-known aviation personalities including Alex Henshaw, Sir Philip Sassoon, Wing Cdr. F. O. Soden, Sir Pyers Mostyn and A. S. Butler. Many were used commercially including *G-ACMA* and '*LY*' flown by the aviation representatives of National Benzole Ltd. and Shell Mex Ltd., '*TG*' executively by Morris Motors Ltd. and '*PG*' by touring members of the Cinque Ports Flying Club at Lympne. Companies such as Olley Air Services Ltd. which used *G-ACLM* and '*PK*'; or Air Taxis Ltd. which had *G-ADWY*, found them ideal for taxi work, as did the Heston based firms Air Commerce Ltd., British American Air Services Ltd. and Birkett Air Services Ltd. who collectively operated a considerable number of Leopard Moths. Several of these, including Birkett's *G-ADCO*, were chartered by newspapers to cover the Abyssinian War of 1936.

Several long distance flights were made in Leopard Moths, the first by T. Neville Stack and F. E. Clifford who left Heston on March 15, 1934, flew to Bathurst and thence into Senegal, recording their experiences by dictaphone in the air with the intention of writing a book on their return. In the same month Bernard Rubin and Ken Waller flew '*LX*' to Australia to survey the route which the former's Comet would fly in the MacRobertson Race and succeeded in breaking the record for the return journey by arriving at Lympne on May 1st in a time of 8 days 12 hours. On the engineering side the prototype Leopard Moth made a valuable contribution to the success of the Comet racers when it became a flight development vehicle for the de Havilland Gipsy Six R engine with variable pitch



The National Benzole Company's prewar Leopard Moth *G-ACMA*, c/n 7042, in wartime impressment colours as *BD148* showing the external stringers of later production models.



The ex-Swiss Leopard Moth *G-ATFU* at Biggin Hill in 1965. (N. B. Rivett Photo.)

airscrew under the designation D.H.85A. Both the Hamilton and Ratier airscrews were tested and the noise of the twenty hours preliminary ground running will long be remembered. Flight tests begun by Geoffrey de Havilland Jnr. on October 23, 1933 ended when the engine was granted type approval in the following August.

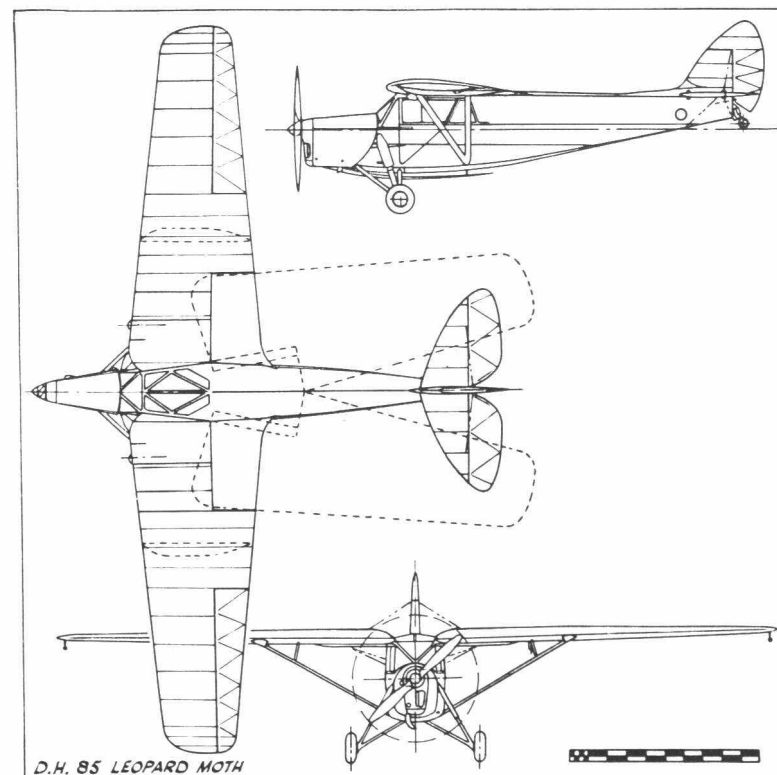
M. Christian Moench, president of the French Aero Club de l'Est, who had taken delivery of Leopard Moth *F-AMXA* in March 1934, later flew it from Marseilles to Madagascar in seven days. On October 10th of that year a red machine without markings landed at Heston to clear Customs for Paris on delivery to Portugal, piloted by Lt. Humberto del Cruz with the inevitable Carlos Bleck as passenger. This aircraft, c/n 7083, was fitted with extra fuel tanks in the cabin and left Lisbon with the same crew on October 25th to visit all the Portuguese possessions overseas and arrived at Dili, Timor on November 7th. The flight was sponsored by the Lisbon daily paper *O Seculo* and the Leopard Moth completed the journey of 43,495 miles by crossing Africa to visit the Cape Verde Islands before returning home to be handed over to the Portuguese Air Force. The last great Leopard Moth flight ended at Lympne on May 3, 1937 when H. F. 'Jimmy' Broadbent landed in *VH-AHB*, only 6 days 8 hours 25 minutes after leaving Darwin. The special cabin fuel tank giving a 1,500 mile range was later removed at Hanworth and the aircraft sold to veteran Redhill private owner Sam Harris as *G-AFDV*.

No fewer than 60 Leopard Moths were sold overseas, many to wealthy owners in France and Switzerland, a vigorous sales drive including the exhibition of the scarlet *CH-368* in immaculate finish at the Geneva Aero Show of April 1934. One went to Algiers to be owned and flown by Mme. Robert Germain, a member of the family owning three Dragons. Others were exported to Argentina, Australia, Austria, Belgium, China, the Congo, Egypt, Germany, Holland, India, Japan, Kenya, Poland, South Africa, Southern Rhodesia and Spain.

Forty-four British Leopard Moths were impressed at the outbreak of the European War for communications duties in camouflage with the R.A.F. and A.T.A. Several of those in India formed part of the Delhi Communi-

cations Flight, and others were 'called up' in Southern Rhodesia, South Africa and elsewhere. Very few survived to re-enter civilian life but in England F. H. Matusch's prewar *G-ACLL* became senior member of the fleet of Derby Aviation Ltd.; *G-ACMA* was sold to J. P. Filhol Ltd. at Baginton; and *G-ACMN*, based at Croydon before the war by Personal Airways Ltd., went into executive use with Alvis Ltd. at Baginton before it was sold to J. J. Parkes in 1967. *G-AIYS*, used by the Surrey Flying Club at Croydon 1956-61 and later for joyriding by Chrisair, came from Iraq in September 1946 as *YI-ABI*, having been supplied new to a wealthy Egyptian as *SU-ABM* twelve years previously. Another unique example, *G-APKH*, was built from parts of an impressed aircraft *G-ACGS* by Mr. P. Franklin and first flew at White Waltham on August 8, 1963.

A handful of veteran Leopard Moths returned to use overseas, four in Australia including *VH-UUE* and *UUL* flown privately by W. Schulz of Hughenden, Q. and L. A. Keith of Naracoorte, S.A. respectively; *VH-BAH*, which 25 years before belonged to G. M. Tonge as *G-ACKY*, was kept at Hebel, Q. by G. W. Cannon; and *VH-AJN* belonged to A. Nixon at Salisbury, Q. Only two were airworthy in India and both were based at Calcutta, J. W. Adamson's former *G-ACSG* was in service with



the Air Survey Co. of India Ltd. as *VT-AHO*; and *G-ACRJ*, then *VT-AKH*, was executive aircraft of Shaw Wallace and Co. Ltd. Two which started life in South Africa were also flying, *VP-KER* for Kagia Farms Ltd. at Nairobi, Kenya and *VP-KFM* at Oldeani, Tanganyika with owner J. A. Gibb. Several Leopard Moths were flown in Switzerland after the war but only three were active in the 1960s, *HB-ABA* and *'ALI* belonging to charter firms Balair and Alpar respectively and *HB-OTA* privately owned. The last was the seventh production aircraft, built to Swiss order as *CH-366* in 1933, which returned to Biggin Hill in 1965 to become *G-ATFU* and later spent some years in private ownership at Rhoose.

SPECIFICATION AND DATA

Manufacturers: The de Havilland Aircraft Co. Ltd., Stag Lane Aerodrome, Edgware, Middlesex. Works transferred to Hatfield Aerodrome, Herts. in 1934

Power Plants: (D.H.85) One 130 h.p. de Havilland Gipsy Major
(D.H.85A) One 230 h.p. de Havilland Gipsy Six R

Dimensions: Span 37 ft. 6 in. Length 24 ft. 6 in.
Height 8 ft. 9 in. Wing area 206 sq. ft.

***Weights:** Tare weight 1,290 lb. All-up weight 2,225 lb.

***Performance:** Maximum speed 137 m.p.h. Cruising speed 119 m.p.h.
Initial climb 550 ft./min. Ceiling 21,500 ft.
Range 715 miles

* Standard D.H.85.

Production:

Constructor's Numbers	Aircraft markings
7000-7025	<i>G-ACHD</i> , <i>'HB</i> , <i>'GS</i> , <i>'HC</i> , <i>ZS-AEE</i> , <i>'EJ</i> , <i>G-ACKJ</i> , <i>CH-366</i> , <i>G-ACKK</i> , <i>'KL</i> , Japan, <i>G-ACNN</i> , <i>'LY</i> , <i>'KN</i> , <i>'KO</i> , <i>VT-AEP</i> , <i>G-ACKY</i> , <i>CH-367</i> , <i>F-AMUP</i> , <i>ZS-AEK</i> , <i>'EP</i> , <i>VH-URK</i> , <i>CH-388</i> , <i>G-ACKR</i> , <i>'MS</i> , <i>'MV</i>
7026-7050	<i>G-ACKM</i> , <i>'LK</i> , <i>'LL</i> , <i>F-AMXN</i> , <i>'XR</i> , <i>OO-NAD</i> , <i>G-ACLM</i> , <i>'KS</i> , <i>F-AMXS</i> , <i>'XP</i> , <i>G-ACLX</i> , <i>F-AMXO</i> , <i>G-ACOS</i> , Argentina, <i>G-ACLZ</i> , <i>F-AMYT</i> , <i>G-ACMA</i> , <i>F-AMXQ</i> , <i>G-ACLN</i> , <i>CH-368</i> , <i>G-ACLW</i> , <i>EC-5E</i> , <i>G-ACLO</i> , <i>'PF</i> , <i>'MN</i>
7051-7075	<i>G-ACPG</i> , <i>'RJ</i> , <i>F-ANBS</i> , <i>G-ACOO</i> , <i>VP-KBE</i> , <i>G-ACPK</i> , <i>'OT</i> , <i>'RC</i> , <i>CH-290</i> , <i>G-ACRV</i> , <i>'RW</i> , <i>'SE</i> , China, <i>G-ACVS</i> , <i>'SF</i> , <i>'SI</i> , <i>F-AMYS</i> , <i>G-ACSJ</i> , <i>'SU</i> , <i>D-EGYV</i> , <i>G-ACTG</i> , <i>'TH</i> , <i>'TJ</i>
7076-7100	<i>G-ACTL</i> , <i>'XH</i> , <i>VP-YAT</i> , <i>G-ACUJ</i> , <i>'UK</i> , <i>'UO</i> , <i>'US</i> , Portugal, <i>VH-USK</i> , <i>VT-AGB</i> , <i>VH-USM</i> , <i>G-ADAA</i> , <i>OO-APS</i> , <i>SU-ABM</i> , <i>G-ADAP</i> , <i>'AR</i> , <i>OO-AVD</i> , <i>G-ADCO</i> , <i>PH-FDK</i> , <i>ZS-AFI</i> , <i>OO-JFC</i> , <i>HB-ABA</i> , <i>PH-JUH</i> , <i>ZS-AET</i> , <i>G-ADFG</i>
7101-7125	<i>VP-YAY</i> , <i>VT-AGG</i> , <i>G-ADEFJ</i> , <i>'HB</i> , <i>HB-OKO</i> , <i>G-ADHD</i> , <i>VP-KBP</i> , <i>EC-W49</i> , <i>VH-UUE</i> , <i>'UG</i> , <i>'UL</i> , South Africa, <i>VP-KBV</i> , <i>'BX</i> , <i>VP-YAZ</i> , <i>ZS-AHA</i> , <i>G-ADWY</i> , <i>VH-UVD</i> , <i>VT-AHA</i> , <i>VH-AHB</i> , <i>VT-AHG</i> , <i>F-AOUH</i> , <i>VT-AHK</i> , <i>'HH</i> , <i>G-AEFR</i>
7126-7130 PPS/85/1/7131 7200	<i>VH-UVF</i> , <i>HB-XAM</i> , <i>G-AENB</i> , South Africa, <i>VT-AIL</i> <i>G-APKH</i> * <i>G-ACKP</i>

* Built by P. Franklin, White Waltham.



The Railway Air Services' single pilot type D.H.86 "Mercury" at Croydon in August 1934.

De Havilland D.H.86

By 1933 the long desired England–Australia service had become technically and commercially possible. An agreement was therefore reached between the British, Indian and Australian Governments for its inauguration in the following year with Imperial Airways Ltd. operating from Croydon to Singapore where it would hand over passengers and mail to an Australian company. The unnamed D.H.86, first de Havilland four motor type, was designed and built in four months to the Australian Government's specification for a fast multi-engined ten seater with which to operate in safety across the Java and Timor Seas. During airframe construction, Maj. F. B. Halford produced the now famous Gipsy Six engine, a six cylinder version of the Gipsy Major, and the first of these was rushed through Air Ministry type tests in time for the prototype D.H.86, *E-2/G-ACPL*, to make its first flight at Stag Lane on January 14, 1934 piloted by H. S. Broad. Rapid Martlesham trials then resulted in the issue of a full C. of A. on January 30th, one day before the expiry of the Australian Government's time limit. Structurally the D.H.86 followed standard de Havilland practice, the fuselage being the usual internally unobstructed plywood box with the spruce stiffening members and sound-proofing on the outside. A fabric covering was then applied to give a slightly rounded appearance in the manner of late production Leopard Moths. The aircraft carried ten passengers and mail and was flown by a single pilot in the nose, assisted by a wireless operator/navigator behind him on the starboard side. The sharply tapered, high aspect ratio mainplanes were of orthodox two spar wooden construction with all four engines on the lower wing. Each half of the undercarriage comprised a trousered unit built integral with an inboard nacelle and housing one of the two 57 gallon fuel tanks.



Holyman's Airways' second D.H.86 *VH-URT* "Loina" which operated the Bass Strait service 1934-35.

Early airline proving was undertaken by the newly formed Railway Air Services Ltd., in whose red, green and silver livery the prototype appeared for the presentation of the first internal air mail pennant by the Postmaster General at Gatwick on May 26th, 1934. In the intervening period it had been fitted with revised undercarriage fairings having straight instead of the original curved fronts and had been fitted temporarily with metal airscrews. *G-ACVY* "Mercury" and 'VZ "Jupiter" were the only other D.H.86s completed for single pilot operation and the first of these inaugurated Railway Air Services' trunk route between Croydon, Castle Bromwich, Barton, Belfast and Renfrew on August 20th. By this time production was in full swing at Hatfield, the 2300 constructor's number block being used for the 62 aircraft completed before manufacture ceased in 1937.

For long haul work the Australian Government called for an increase in tankage to 183 gallons and for side by side seating for Captain and First Officer. To meet the latter requirement the prototype was fitted at Hatfield with an elongated two seat nose and reappeared in Imperial Airways colours with the name "Delphinus" in the following August. QANTAS and all subsequent D.H.86s were also fitted with split trailing edge flaps on the upper mainplane and operated at an all-up weight of 10,000 lb. Lester Brain, chief pilot of the newly formed QANTAS Empire Airways Ltd., successful tenderers for the Singapore-Brisbane section of the Empire Air Route, left Croydon on September 24th in the company's first D.H.86 *VH-USC*, and arrived in Brisbane on October 13th. This was not the first of the type in Australia however, as the first production aircraft *VH-URN* had already been shipped to Holyman's Airways Pty. Ltd. which had been awarded the contract for the final section of the route between Melbourne and Hobart, Tasmania. This short lived aircraft vanished off Wilson's Promontory on October 19th with Victor Holyman, the navigator and ten passengers, a tragedy closely followed by the crash of the fifth Q.E.A. machine *VH-USG* near Longreach at the end of its

ferrying flight on November 15th with the loss of Capt. D. R. Prendergast and crew. The fourth aircraft was also flown out but the second and third went by sea pending the result of investigations by the Australian Department of Civil Aviation and the use of *VH-USF* for flying trials at Hatfield and Martlesham with one and two engines cut out on one side. Structural tests were also made at Hatfield and although these revealed no unusual behaviour and no structural weakness, several precautionary modifications were embodied including the strengthening of the fin, the removal of the rudder servo tab and filling in the space. The trials ended on January 7, 1935 by which time the Q.E.A. contract had been completed by diverting an Imperial Airways D.H.86 as a replacement aircraft *VH-UUA*. All five were named after State capitals and the first regular external service by an Australian registered aircraft was flown by Cpts. G. U. Allan and W. H. Crowther in "R.M.A. Canberra" ex Brisbane on February 25, 1935. It covered the 518 mile Timor Sea leg from Darwin to Koepang in 3 hours 10 minutes and arrived in Singapore on the 28th. The 86s then settled down to rigid schedules and gave no further trouble until Holyman's second aircraft "Loina" fell into the sea off Flinders Island on October 2nd with the loss of five lives. The replacements "Lepena" and "Loila" flew the daily Sydney-Melbourne service after Holyman was taken over by Australian National Airways in July 1936.

Jersey Airways Ltd. replaced Dragons with six D.H.86s on the Heston-Eastleigh-Channel Islands service and three dark blue, unnamed examples flew the Stapleford-Paris route of Hillmans Airways Ltd. Four D.H.86s also superseded Dragons on Mistr Airwork's services between Cairo, Alexandria, Assuit, Baghdad, Cyprus and Haifa, while late in 1935 three were shipped to New Zealand. They were assembled at Wigram and given the names of local birds for use by Union Airways of New Zealand Ltd. on a passenger and mail service between Palmerston North, Blenheim, Christchurch and Dunedin inaugurated on January 16, 1936. By the time it ceased on September 25, 1939 the three D.H.86s had flown 1,373,000



Imperial Airways' "Dido", c/n 2334, showing the change of windscreen angle which identified the D.H.86A.

miles and were afterwards absorbed by the R.N.Z.A.F. for training purposes. Eventually all were seriously damaged, and out of their remains the de Havilland Aircraft Co. of New Zealand Ltd. constructed a new machine which reverted to the original owners after the war.

Late in 1935 an improved model was introduced having pneumatic undercarriage legs, larger brakes and tail wheel, metal rudder and a less steep pilots' windscreen. Designated D.H.86A, it was available in two versions, with Gipsy Six I engines driving two bladed wooden or Fairey-Reed duralumin airscrews at an increased all-up weight of 10,250 lb.; or with Gipsy Six II high compression engines driving de Havilland variable pitch airscrews and operating at 11,000 lb. all-up weight. Only one D.H.86A had the Gipsy Six II installation. This was *E-2*, tested at Martlesham with very small inset auxiliary fins before reverting to standard with Gipsy Six Is for delivery to Misr Airwork Ltd. as *SU-ABV*.



Union Airways' first D.H.86 ZK-AEF "Kotuku" at Blenheim aerodrome in 1936. (Union Airways Photo.)

During 1936 Imperial Airways Ltd. put the first D.H.86A *G-ADFF* "Dione" and eleven others into service on their European network and on the Khartoum-Accra route opened by "Daedalus" on February 13, 1936. On March 23rd "Dorado" inaugurated the Penang-Saigon-Hong Kong shuttle on which "Dardanus" was shot up by a Jap fighter near Wai Chao in 1939. Also in 1936 the Hillman D.H.86s were taken over by British Airways Ltd. to supplement its fleet of four D.H.86As on unsubsidised day passenger and night mail services between Gatwick and the Continent; and two 18 seaters, *G-ADVJ* and 'VK, maintained the Isle of Man ferry of Blackpool and West Coast Air Services Ltd. *G-ADVJ* subsequently became "Eire", the first four engined aircraft owned by Aer Lingus, which in 1938 acquired another, "Sasana", from Imperial Airways Ltd. to enable daily schedules to be flown between Dublin, the Isle of Man and Speke, or Bristol and Croydon. After the loss of British Airways' *G-ADYF* in September 1936, 'YH was the subject of a Martlesham report criticising rudder and aileron control which led to the attachment of large auxiliary fins to the end of the tailplane. In this form the aircraft was known as the D.H.86B, the handling qualities of which were acceptable,

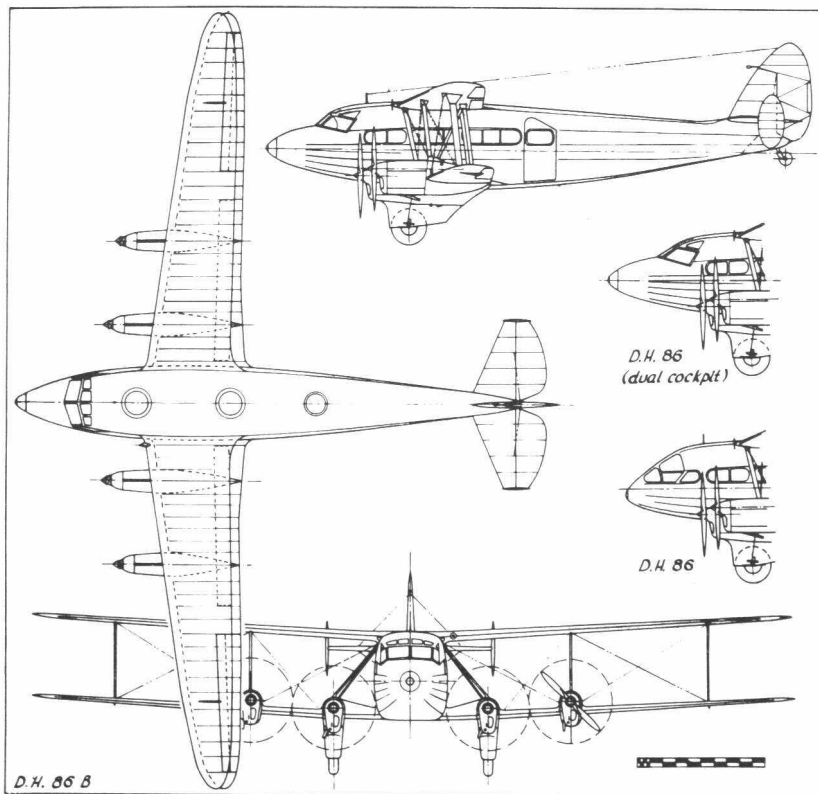
and all existing D.H.86As were then similarly modified.

The final developmental stage was the construction of ten production D.H.86Bs having tailplanes with increased chord at the tips and higher gearing in the aileron circuit. The first of these, *G-AENR*, tested at Martlesham in February 1937, was followed by "Venus" for Railway Air Services Ltd. and "Silver Star" flown on the Woolsington-Stavanger service of Allied Airways Ltd. in 1938, on the Weston-Cardiff ferry of Western Airways Ltd. in the following year and in 1940 as an ambulance of the Finnish Naval Coastguard Service. Four were sold to the Turkish State Airline (Devlet Hava Yollari) for its Istanbul-Ankara-Izmar and Ankara-Adana routes, while the last three built were shipped to Australia for the 3,000 mile service operated by W. R. Carpenter and Co. Ltd. between Sydney and Rabaul, via Townsville, Thursday Island and Port Moresby.

In 1938 British Airways Ltd. standardised the Lockheed 10A Electra and two of its D.H.86Bs were sold to Wearnes Air Services Ltd. for Malayan routes linking Singapore with Kuala Lumpur and Penang; two to Uruguay for the internal routes of Cia Primeras Lineas Uruguayas de Navegacion Aerea (P.L.U.N.A.) connecting Montevideo with Artigas and Rivera; and four others to the Air Ministry. Two of these became V.I.P. transports with No. 24 (Communications) Squadron at Hendon and the others, complying with Specification 28/37, were used as flying classrooms for navigator and wireless operator training. At the outbreak of war several civil D.H.86s and D.H.86Bs were impressed for ferrying supplies to the British Army in France where "Neptune" and "Venus" were destroyed by enemy action in June 1940. Most of the Australian D.H.86As were impressed by the R.A.A.F. but in May 1942 *VH-USC* and 'SF were returned to Q.E.A. to have long range tanks and altitude controls fitted for 18 flights over the 12,000 ft. mountains of the Bismarck Range in New Guinea during the Mount Hagen evacuation. Later in the year they returned to New Guinea and on December 13th began a series of supply dropping flights to Buna in the mountainous interior, afterwards returning to Brisbane to continue their normal weekly mail service to Darwin. Early in the war two others were sold to Tata Airlines Ltd. in India where they were flown in camouflage until impressed in 1942. Several of those used by the R.A.A.F. saw heroic service with No. 1 Air Ambulance Unit in the Western Desert where at least one was shot down by the Luftwaffe, replacements being supplied from impressed B.O.A.C. aircraft.

A number of these ageing biplanes reappeared after the war, including the original Q.E.A. machine "Canberra" which in ten years of service had flown 11,664 hours and covered a mileage equivalent to a flight between Australia and England once a month during the whole period. The old D.H.86s *G-ACVY* and 'ZP and the D.H.86Bs *G-ADYH* and 'ENR which had flown in camouflage throughout the war on the skeleton services of Associated Airways Joint Committee, reverted to Railway

Air Services colours in 1946 and continued to ply between Croydon, Speke and Belfast. They were withdrawn in 1948 when a main spar of the 14-year-old "Mercury" broke in the air while on the circuit at Speke. A safe landing was made but it never flew again. Two of the Mistr Airwork aircraft also survived, one going to Peacock Air Charter in Alexandria after overhaul at Hanworth in 1947, and the other to Skytravel Ltd. of Speke and eventually to Union Air Services Ltd. at Gatwick. This firm also acquired the two Aer Lingus machines and all three ended their days at Bahrein in 1952 with Gulf Aviation Ltd. *G-ADYH*, long since denuded of special engines and variable pitch airscrews, operated postwar with Skytravel Ltd. but was disposed of to H. W. G. Penny in 1948 and flown first to Australia and thence to Indonesia. After capture by the Dutch at Manguwo on December 12, 1948 it was broken up at Bandoeng. The last airworthy specimen of the type was the one time Jersey Airways D.H.86 *G-ACZP*, which after a chequered career was overhauled by the Hampshire Aeroplane Club under the enthusiastic guidance of V. H. Bellamy only to be damaged beyond repair when the undercarriage collapsed at Madrid on September 21, 1958.



SPECIFICATION AND DATA

Manufacturers: The de Havilland Aircraft Co. Ltd., Hatfield Aerodrome, Herts.

Power Plants: Four 200 h.p. de Havilland Gipsy Six series I
Four 205 h.p. de Havilland Gipsy Six series II

Dimensions: Span 64 ft. 6 in. Length 46 ft. 1 in.*
Height 13 ft. 0 in. Wing area 641 sq. ft.

* Single pilot type D.H.86, 43 ft. 11 in.

Weights and Performances:

	Prototype	D.H.86*	D.H.86A		D.H.86B
			Gipsy Six I	Gipsy Six II	
Tare weight	5,637 lb.**	6,303 lb.	6,140 lb.***	7,228 lb.	6,489 lb.
All-up weight	9,200 lb.	10,000 lb.	10,250 lb.	11,000 lb.	10,250 lb.
Maximum speed	170 m.p.h.	170 m.p.h.	166 m.p.h.	150 m.p.h.	166 m.p.h.
Cruising speed	145 m.p.h.	145 m.p.h.	142 m.p.h.	135 m.p.h.	142 m.p.h.
Initial climb	1,140 ft./min.	1,200 ft./min.	925 ft./min.	1,100 ft./min.	925 ft./min.
Ceiling	—	20,500 ft.	17,400 ft.	18,000 ft.	17,400 ft.
Range	450 miles	760 miles	760 miles	748 miles	800 miles

* Two pilot type.

** Single pilot production type 5,520 lb.

*** 6,730 lb. when modified to D.H.86B.

Production:

	Constructor's No. and Registration	C. of A. Issued	Remarks
(a) Single pilot type D.H.86			
2300	<i>G-ACPL</i>	30. 1.34	R.A.S., rebuilt for two crew as I.A.L. "Delphinus"; impressed in the Middle East 2.42 as <i>HK844</i>
2301	<i>VH-URN</i>	25. 7.34	Holyman's Airways "Miss Hobart", lost in the Bass Strait 19.10.34
2302	<i>G-ACVY</i>	15. 8.34	R.A.S. "Mercury", broken up at Langley 1948
2303	<i>G-ACVZ</i>	7.12.34	R.A.S. "Jupiter", crashed at Elsdorf near Cologne during the night of 15-16.3.37
(b) Two crew type D.H.86			
2304	<i>G-ACWC</i>	5. 3.35	I.A.L. "Delia", crashed at Minaa, Nigeria 17.6.41
2305	<i>G-ACWD</i>	28. 2.35	I.A.L. "Dorado", impressed at Cairo 2.42 as <i>HK829</i> ; beyond repair landing Noffutton North 17.3.43
2306	<i>G-ACWE</i>	14. 2.35	To QANTAS 7.34 as <i>VH-UAA</i> "Adelaide"; to Tata Airlines Ltd. 9.38 as <i>VT-AKM</i> ; impressed in India 7.42 as <i>HX789</i>
2307	<i>VH-USC</i>	13. 9.34	QANTAS "Canberra"; to MacRobertson-Miller 7.38; impressed as <i>A31-5</i> , restored to QANTAS, crashed at Darwin 9.10.44
2308	<i>VH-USD</i>	24. 9.34	QANTAS "Brisbane"; to Tata 8.38 as <i>VT-AKZ</i> ; impressed 6.40 as <i>AX800</i> , d.b.r. Ahmedabad 18.12.41
2309	<i>VH-USE</i>	2.10.34	QANTAS "Sydney", crashed at Mt. Pirie, near Brisbane 20.2.42

Constructor's No. and Registration	C. of A. Issued	Remarks
2310 <i>VH-USF</i>	27.12.34	QANTAS "Melbourne"; impressed 9.40 as <i>A31-6</i> ; restored to MacRobertson-Miller, crashed at Geraldton, W.A. 24.6.45
2311 <i>VH-USG</i>	18.10.34	QANTAS, crashed at Barradale, near Longreach, Q., 15.11.34
2312 <i>VH-URT</i>	8.11.34	Holyman's Airways "Loina", crashed off Flinders Island 2.10.35
2313 <i>G-ACYF</i>	6. 2.35	Jersey Airways Ltd. "Giffard Bay"; to Wearnes 6.38 as <i>VR-SBD</i> "Governor Murchison"; to Australia as <i>VH-ADN</i> , impressed as <i>A31-2</i>
2314 <i>G-ACYG</i>	8. 3.35	Jersey Airways Ltd. "Grouville Bay"; to Donibristle 7.40 as <i>AX840</i> ; scrapped by D.H.s 14.3.45
2315 <i>VH-USW</i>	6. 3.35	Holyman's Airways "Lepena", impressed 9.40 as <i>A31-4</i> , temporarily QANTAS 3.42-5.42 as <i>VH-USW</i> , to A.N.A. 5.45, sold to Universal Flying Services Ltd., Fair Oaks 1946, not delivered.
2316 <i>G-ACZN</i>	22. 3.35	Jersey Airways Ltd. "St. Catherine's Bay", crashed at Jersey Airport 4.11.38
2317 <i>G-ADCM</i>	30. 3.35	I.A.L. "Draco", crashed at Zwettl, Austria 22.10.35
2318 <i>G-ACZO</i>	9. 4.35	Jersey Airways Ltd. "Ouaine Bay", to Royal Navy 7.40 as <i>AX841</i> ; destroyed by enemy action, Leeson-Solent 16.7.40
2319 <i>G-ADCN</i>	15. 4.35	I.A.L. "Daedalus", destroyed by fire at Bangkok 3.12.38
2320 <i>SU-ABN</i>	27. 5.35	Misr Airwork Ltd. "Khartoum", delivered ex Hatfield 10.6.35
2321 <i>G-ACZP</i>	11. 5.35	Jersey Airways Ltd. "Belcroute Bay"; impressed 7.40 as <i>AX843</i> ; released to R.A.S. 9.40; to Skytravel Ltd. 1948; to Lancashire Aircraft Corporation 1950; damaged beyond repair at Barajas, Madrid 21.9.58
2322 <i>G-ACZR</i>	29. 5.35	Jersey Airways Ltd. "La Saline Bay"; to No. 782 Squadron, Donibristle 7.40 as <i>AX844</i> ; spun in at Donibristle 31.3.43
2323 <i>G-ADEA</i>	5. 6.35	Hillmans Airways Ltd.; to British Airways Ltd. '36; to Wearnes 6.38 as <i>VR-SBC</i> ; to Australia as <i>VH-UZX</i> , impressed as <i>A31-7</i>
2324 <i>G-ADEB</i>	20. 6.35	Hillmans Airways Ltd.; to British Airways Ltd. '36, crashed near Altenkirchen, Germany 12.8.36
2325 <i>G-ADEC</i>	1. 7.35	Hillmans Airways Ltd.; to British Airways Ltd. '36; to P.L.U.N.A. 9.38 as <i>CX-AAH</i>
2326 <i>VH-UUB</i>	15. 7.35	Holyman's Airways "Loila"; to A.N.A., impressed as <i>A31-3</i>
2327 <i>G-ADMY</i>	10. 8.35	Wrightways Ltd.; to British Continental Airways Ltd. 2.37 as "St George"; to Donibristle 4.40 as <i>X9442</i> , struck off charge 4.44
2329 <i>SU-ABO</i>	20. 9.35	Misr Airwork Ltd. "Al Fostat" later "Beyrouth"
2330 <i>ZK-AEF</i>	23. 9.35	Union Airways "Kotuku", impressed 9.39 as <i>NZ552</i> Parts used to build 'NZ553', civil 1945 as <i>ZK-AHW</i>
2331 <i>ZK-AEG</i>	8.10.35	Union Airways "Karoro", impressed 9.39 as <i>NZ553</i> "Korimako", dismantled at Milsom in 1946
2332 <i>ZK-AEH</i>	31.10.35	Union Airways "Korimako", impressed 9.39 as <i>NZ554</i>

Constructor's No. and Registration	C. of A. Issued	Remarks
(c) D.H.86A (converted to D.H.86B in 1937)		
2328 <i>G-ADFF</i>	13. 1.36	I.A.L. "Dione", impressed at Lydda 2.41 as <i>AX760</i>
2333 <i>G-ADUE</i>	20. 1.36	I.A.L. "Dardanus", impressed 2.41 as <i>AX762</i>
2334 <i>G-ADUF</i>	24. 1.36	I.A.L. "Dido", to Misr Airwork Ltd. as <i>SU-ACR</i> "Beirut", impressed 2.42 as <i>HK828</i> , restored to Gulf Aviation Ltd., Bahrain 5.48 as <i>G-ADUF</i>
2335 <i>G-ADUG</i>	7. 2.36	I.A.L. "Danae", impressed in the Middle East 2.42 as <i>HK831</i> and cannibalised
2336 <i>G-ADUH</i>	7. 3.36	I.A.L. "Dryad"; to Aer Lingus 10.38 as <i>EI-ABT</i> "Sasana"; restored as <i>UH</i> 11.46, to Gulf Aviation Ltd. 5.51, written off in ground collision with Auster J-1 <i>G-AIBO</i> at Bahrain about 6.51
2337 <i>G-ADUI</i>	18. 2.36	I.A.L. "Denebola", impressed in the Middle East 2.42 as <i>HK830</i> , beyond repair, Bilbeis 11.3.42
2338 <i>G-ADVJ</i>	8. 4.36	Blackpool and West Coast Air Services Ltd. "Ronaldsway"; to Aer Lingus 9.36 as <i>EI-ABK</i> "Eire"; restored as <i>G-ADVJ</i> 10.46, derelict at Bahrain 8.52
2339 <i>G-ADVK</i>	21. 4.36	Blackpool and West Coast Air Services Ltd., lost in Jersey 6.40
2340 <i>G-ADYC</i>	14. 5.36	British Airways Ltd.; to the R.A.F. for W/T training at Cranwell 11.37 as <i>L8037</i>
2341 <i>G-ADYD</i>	19. 5.36	British Airways Ltd. to the R.A.F. for navigation training at Cranwell 11.37 as <i>L8040</i>
2342 <i>SU-ABV</i>	1. 1.37	Misr Airwork Ltd. "Al Mahroussa"; to Peacock Air Charter 4.47 as <i>G-AJNB</i> "Paul", derelict at Wadi Halfa 1949
2343 <i>G-ADYG</i>	30. 6.36	British Airways Ltd.; to No. 24 Squadron, Hendon 6.38 as <i>N6246</i>
2344 <i>G-ADYH</i>	21. 7.36	British Airways Ltd.; to R.A.S. 8.40; flown to Australia 10.48; broken up at Bandoeng 1949
2345 <i>G-ADYI</i>	26. 8.36	British Airways Ltd.; to No. 24 Squadron, Hendon 4.40 as <i>AX795</i> ; scrapped at Halton 5.43



D.H.86B *L8037*, c/n 2340, with Gipsy Six I engines, fixed pitch metal airscrews and large end plate fins. Equipped for R.A.F. W/T training, it was a former British Airways D.H.86A. (Crown Copyright Reserved.)

	Constructor's No. and Registration	C. of A. Issued	Remarks
2346	G-ADYE	28. 7.36	British Airways Ltd.; to P.L.U.N.A. 11.37 as CX-ABG
2347	G-ADYF	2. 9.36	British Airways Ltd., crashed on night take off at Gatwick 15.9.36
2348	G-ADYJ	19. 5.36	British Airways Ltd.; to No. 24 Squadron 10.37 as L7596, crashed at Ulverston, Lancs. 29.7.39
2349	G-AEAP	17. 3.36	I.A.L. "Demeter", impressed in the Middle East 2.42 as HK843; burned out, Pachino, Sicily 23.7.43
2350	G-AEFH	10. 8.36	R.A.S. "Neptune", lost in France 6.40
2351	G-AEJM	24. 9.36	Wrightways Ltd., to No. 24 Squadron 4.40 as X9441 "The Cathedral"; beyond repair by engine fire, Hendon 17.2.42



The first Aer Lingus D.H.86A EI-ABK "Eire" at Bristol Airport, Whitchurch in 1936.
(W. K. Kilsby Photo.)

(d) **Production D.H.86B**

2352	G-AENR	8. 2.37	Blackpool and West Coast Air Services Ltd.; impressed 7.40 as AX842; released to R.A.S. 8.40, scrapped at Langley 11.48
2353	G-AETM	29. 6.37	Allied Airways Ltd. "Silver Star"; to Western Airways Ltd. 1939; to Finland 12.39 as OH-SLA, later OH-IPA; destroyed on ground, Malmö
2354	G-AEWR	29. 6.37	R.A.S. "Venus", lost in France 6.40
2355	G-AFAJ	18. 8.37	To Turkey 9.37 as TC-ERK
2356	G-AFAK	8. 9.37	To Turkey 9.37 as TC-FER
2357	G-AFAL	30. 9.37	To Turkey 9.37 as TC-GEN
2358	G-AFAM	29.10.37	To Turkey 12.37 as TC-HEP
2359	VH-UYU	30.11.37	W. R. Carpenter Ltd.; impressed as A31-8
2360	VH-UYV	18.12.37	W. R. Carpenter Ltd.; impressed as A31-1
2361	VH-UYW	30.12.37	W. R. Carpenter Ltd.; crashed in New Guinea 15.3.40

Abbreviations—I.A.L. . . . Imperial Airways Ltd.; A.N.A. . . . Australian National Airways Ltd.; R.A.S. . . . Railway Air Services; d.b.r. . . . damaged beyond repair.

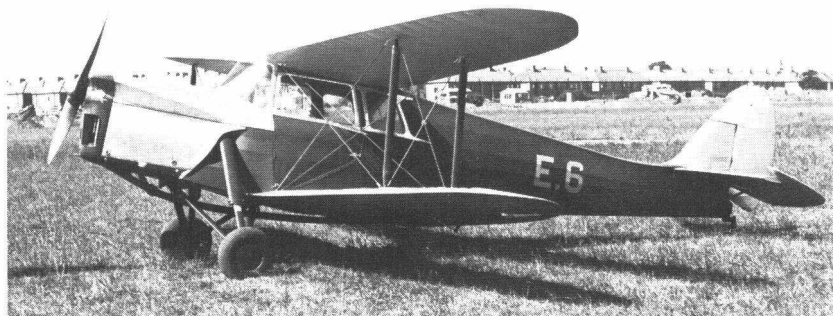


G-ADIS, the second production aircraft, c/n 8001, showing the pointed wing tips of the D.H.87A Hornet Moth. ('Flight' Photo 14911.)

De Havilland D.H.87 Hornet Moth

The D.H.87 originated in 1934 as an experimental aeroplane to explore the suitability of the side-by-side cabin biplane as a replacement for the Gipsy Moth. Up to that time the pilot of de Havilland light cabin types always sat away from the passengers so that his attention might not be distracted, but the Hornet Moth ended this practice and for the first time permitted sociability and paved the way for a revolution in *ab initio* instruction. It bore a marked resemblance to the Leopard Moth and employed the same type of rear fuselage construction but the front fuselage was built of welded steel tubing, Puss Moth fashion. The under-carriage fairings again rotated to form air brakes but the shapely, tapered wood and fabric mainplanes, easily spread or folded by one man, were reminiscent of its larger relative the D.H.86. Full dual flying controls were provided, the stick being mounted in the centre between the seats, with two handles extending in the form of a V over each of the two seats. A large welded aluminium fuel tank of 35 gallons capacity located behind the pilot's seat gave a standard range of nearly 600 miles and the space above it formed a rack for two large suitcases. A cruising speed of 111 m.p.h. on the power of one Gipsy Major made the Hornet Moth an attractive touring aircraft indeed.

Capt. Geoffrey de Havilland made the first flight in the prototype, E-6, at Hatfield on May 9, 1934 and in accordance with the company's usual proving and publicity techniques, flew it in the King's Cup Race as G-ACTA on July 13th, only to be eliminated in the heats after averaging 127 m.p.h. Two further Hornet Moths, E-1/G-ADIR and 'IS were then built to assist the prototype in a flight test programme which lasted a year and eradicated a number of teething troubles before construction began on any scale. The production model, designated D.H.87A, had more sharply tapered mainplanes which although 2 ft. greater in span, were of



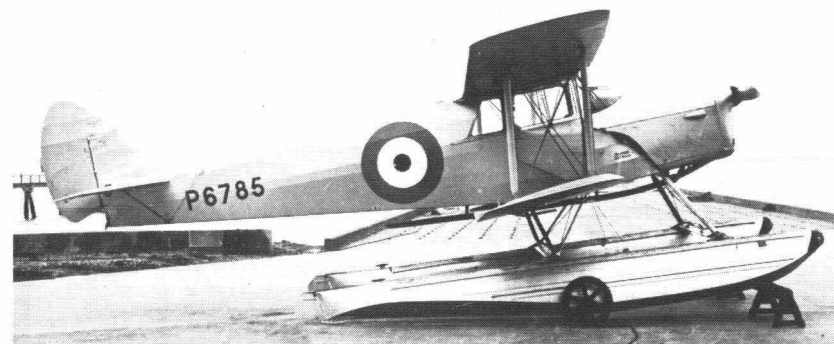
The prototype D.H.87 Hornet Moth E-6, c/n 1997, showing the original rounded wing tips. ('Flight' Photo 10566S.)

the same area. The front fuselage side panels were larger and the tankage was increased from 26 to 36 gallons. Constructor's number sequence commencing at 8000 was allocated and the first production batch left the factory in August 1935. During the three years up to May 1938, 165 Hornet Moths were built, 84 of which were to British order. It was soon discovered that in certain circumstances the D.H.87A demanded more skill than that possessed by the average A Licence pilot, and early in 1936 mainplanes of new design to eliminate wing drop at the stall were fitted to the third machine *G-ADIS*. These wings had only a slight amount of taper and were almost square cut at the ends and when fitted with them the Hornet Moth carried the designation D.H.87B. The exact point at which factory production switched to the D.H.87B is obscure but it is known that O. R. Guard's *G-ADOT*, the 28th aircraft, still owned by the Herts and Essex Aero Club in 1961, was certainly built as a D.H.87A and the 45th, *G-ADMS*, went to Martlesham for type test as 87B in February 1936. The new model gave no trouble whatever and owners were invited to trade in their original mainplanes so that eventually only a few D.H.87As remained in the Dominions and five in Britain. These were the prototype, flown on de Havilland communications duties as a camouflaged civil aeroplane along with D.H.87B *G-ADUR* during the Second World War, Geoffrey Linnell's *G-ADJZ*, Lady Loch's 'KA, W. D. Macpherson's 'KI and a French machine, *F-ARAX*, re-imported by Airwork Ltd. as *G-AFHX* in June 1938.

During its brief prewar career the Hornet Moth became a popular aircraft in the private, club and executive fields both at home and overseas but aspired to none of the record breaking epics of its older relatives. The largest single fleet, numbering ten, formed the equipment of a chain of flying clubs operated in Southern England by the Straight Corporation, while others served with the Border, Lancashire, London, Norfolk and Norwich, R.A.F., Scottish and Yorkshire clubs. Three were flown by the aviation representatives of Shell Mex and B.P. Ltd. and one by the Fairey

Aviation Co. Ltd. Lord Londonderry's was *G-ADMR*, A. S. Butler's was 'KU, W. Lindsay Everard's 'LY was named "Leicestershire Foxhound II" and Lt. Col. F. O. Cave kept *G-AFED* in the Sudan. One Hornet Moth, unidentified, was first flown at Hatfield with an experimental tricycle undercarriage by Geoffrey de Havilland Jnr. on December 1, 1937.

The type shared the popularity of its forebears and secondhand specimens found a ready market overseas for example in New Zealand and Uruguay, where they kept company with new Hornet Moths shipped out from the Hatfield works. The de Havilland companies in the Dominions assembled imported Hornet Moths in the following quantities—South Africa 17, Canada 11, Australia 7 and India 4; at the same time others were delivered by air and sea to Austria, Belgium, Denmark, Egypt, Eire, France, Greece, Hong Kong, Java, Kenya, Northern and Southern Rhodesia, Singapore, Spain, Sweden and Switzerland. de Havilland Aircraft of Canada Ltd. was entrusted with the design and construction of a seaplane undercarriage which used Fairchild metal floats and one Hornet Moth seaplane, *CF-AYJ*, became the personal aircraft of P. C. Garrett,



Square cut wing tips identified the D.H.87B Hornet Moth. The illustration shows P6785, c/n 8126, one of four supplied to the Air Ministry on Fairchild floats in 1938. (Imperial War Museum Photo MH.2858.)

Managing Director of the firm. Four others were supplied to the British Air Ministry for evaluation as seaplane trainers and after extensive tests at the M.A.E.E., Felixstowe, were restored to wheels and despatched to Lee-on-Solent in June 1939. Two of them survived the war to reappear in 1946 at White Waltham where, stripped of camouflage they were reconditioned before joining the fleet of Hornet Moths at that time used by the West London Aero Club. Both were still on the active list in 1987, flown privately by Dr. Helene Hamilton at Doncaster and P. A. and F. P. Glidden at Wyberton respectively.

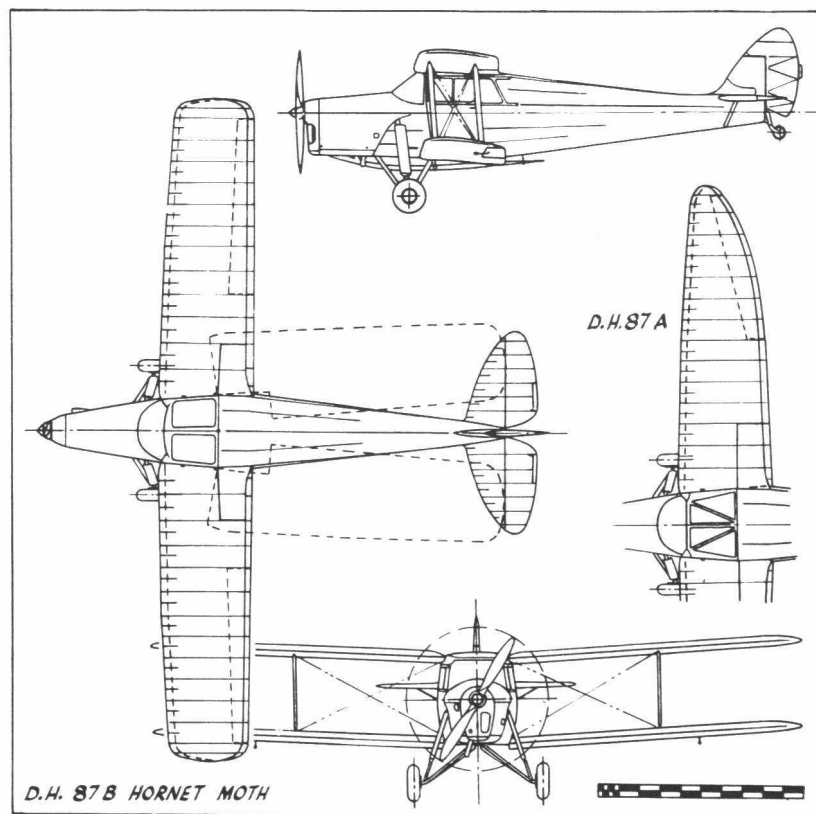
The vast majority of British registered Hornet Moths were relatively new in 1939 and being ripe for impressment, were snapped up rapidly by the R.A.F. as communications aircraft and for the calibration of early

radar installations. Hornet Moth *OY-DOK* even succeeded in escaping from German-occupied Denmark and was taken over by No. 24 Squadron in December 1941 as *HM498*. A high proportion, 24, survived to fly again as civil aircraft, notably with the London Aeroplane Club at Panshanger, and in 1987, 50 years after production ceased, eleven Hornet Moths were filling their time-honoured roles in Britain and others survived in Australia, Canada and elsewhere, including at least one tapered wing D.H.87A *VH-UTE*.

SPECIFICATION AND DATA

Manufacturers: The de Havilland Aircraft Co. Ltd., Hatfield Aerodrome, Herts.
Some airframes assembled by de Havilland Aircraft Ltd. in Australia, Canada, India and South Africa.

Power Plants: One 130 h.p. de Havilland Gipsy Major 1 or 1F
One 145 h.p. de Havilland Gipsy Major 1C (in Canada)



Dimensions, Weights and Performances:

	D.H.87	D.H.87A	D.H.87B	
			Landplane	Seaplane
Span . . .	30 ft. 7 in.	32 ft. 7 in.	31 ft. 11 in.	31 ft. 11 in.
Length . . .	24 ft. 11½ in.	24 ft. 11½ in.	24 ft. 11½ in.	26 ft. 6 in.
Height . . .	6 ft. 7 in.	6 ft. 7 in.	6 ft. 7 in.	9 ft. 6 in.
Wing area . . .	220½ sq. ft.	220½ sq. ft.	244½ sq. ft.	244½ sq. ft.
Tare weight . . .	1,170 lb.	1,192 lb.	1,241 lb.	1,405 lb.
All-up weight . . .	1,800 lb.	1,925 lb.	1,950 lb.*	2,000 lb.
Maximum speed . . .	117 m.p.h.	131 m.p.h.	124 m.p.h.	115 m.p.h.
Cruising speed . . .	—	111 m.p.h.	105 m.p.h.	95 m.p.h.
Initial climb . . .	680 ft./min.	800 ft./min.	690 ft./min.	675 ft./min.
Ceiling . . .	—	17,800 ft.	14,800 ft.	—
Range . . .	—	640 miles	620 miles	500 miles

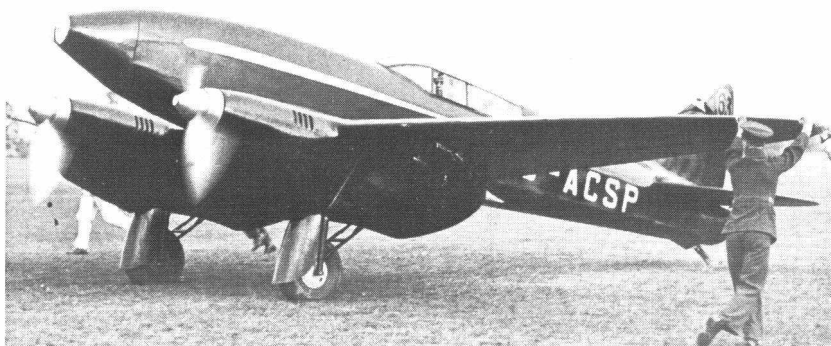
* Later increased to 2,000 lb.

Production:

Constructor's Numbers	Aircraft markings
1997	Prototype E-6/G-ACTA
8000-8025	G-ADIR, 'IS, 'JU-'JY, 'KA, 'JZ, CF-AVH, VT-AGE, 'GF, G-ADKB, ZS-AFR, G-ADKT, VP-YBA, G-ADKD, VP-KBM, G-ADKE, 'KF, 'LY, HB-OFE, OE-DKS, VH-UTE, OO-ROB, SE-AEK
8026-8050	VP-RAD, G-ADOT, HB-UIM, G-ADKI, CF-BFH, CF-AYG, G-ADKJ, 'KK, CS-AAS, G-ADKL, VH-UUD, G-ADKM, HB-OBE, EC-W51, VR-RAI, VH-UUW, G-ADKO, EC-W52, G-ADMS, 'KR, 'KS, ZS-AFY, 'FZ, EC-W53, HB-OMI
8051-8075	G-ADKU, CF-BBE, CF-BFG, G-ADKV, HB-OBI, F-AONI, SU-ABT, F-AQMM, ZS-AHF, 'HG, P6788, CF-AYJ, HB-OFA, G-ADKC, OY-DOK, G-ADMJ, G-AEII, G-ADKH, 'ML, VR-SAN, G-AEMG, G-ADMM, 'KN, 'KW, VP-YBE
8076-8100	G-ADMN, VH-UVV, 'UX, EC-W55, G-ADNB, 'KP, 'MP, EC-W56, G-ADNC, 'UR, 'MO, 'MR, ZS-AHP, G-ADNE, OO-RDK, G-ADSK, G-AEET, G-ADMT, OE-DKK, PK-WDR, G-ADSI, 'ND, 'SL, CR-AAA, G-AEKS
8101-8125	G-AEKP, 'KY, ZS-AHU, CR-AAC, G-AELO, 'PV, EI-ABL, G-AESE, 'TC, VH-UXO, 'YO, G-AEUV, ZS-AKA, G-AEWM, OY-DIL, G-AEWY, ZS-AKG, 'KF, F-APZA, EI-ABO, ZS-ALA, G-AEXM, ZS-AKH, F-AQZV, VT-AIU
8126-8150	P6785 (later G-AHBL), CF-BFK, VT-AIT, VR-HCW, F-AQZB, G-AEZG, 'ZH, 'ZT, P6787, P6786 (later G-AHBM), SE-AGE, G-AFAT, G-AEZY, VH-UYX, G-AFBG, 'BH, ZS-ANN, VP-YBS, F-AQJR, G-AFDF, 'DG, F-AQJS, ZS-AOT, G-AFDY, 'DT
8151-8163	F-ARAQ, OY-DON, 'UN, G-AFDW, 'EE, 'EF, 'EC, 'HE, SX-AAI, G-AFDU, ZS-AOA, G-AFED, ZS-APD

D.H.87B Hornet Moth seaplanes supplied to the British Air Ministry in 1938: (c/n 8126) P6785, ex CF-BFJ, later G-AHBM*; (8135) P6786, ex CF-BFN, later G-AHBL*; (8134) P6787, ex CF-BFJ; (8061) P6788, ex CF-AYI.

* By visual inspection 1946. Identities were changed to (8135) G-AHBL and (8126) G-AHBM during British civil conversions.



The Mollisons at the start of the Australia Race, Mildenhall, October 20, 1934.

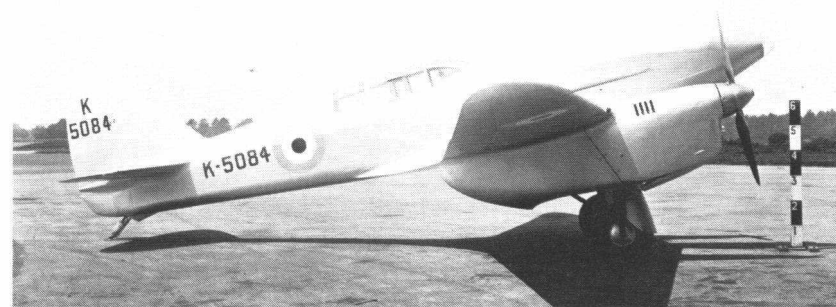
De Havilland D.H.88 Comet

In March 1933 the well known Australian philanthropist Sir MacPherson Robertson put up £15,000 in prize money for a 12,300 mile air race from England to Australia to commemorate the centenary of the foundation of the State of Victoria. Existing aircraft with the necessary speed and range were at that time mainly American and the Comet was the direct result of a determination on the part of the de Havilland directors that the winner should be British, even at a financial loss to the company. Their willingness to build 200 m.p.h. racers at a nominal £5,000 each, was given considerable publicity in the Australian and British press but the announcement also stipulated that orders must be placed by February 1934. The offer was accepted and with only nine months to go before the start of the race, three aircraft were ordered straight from the drawing board by Jim and Amy Mollison, racing motorist Bernard Rubin, and A. O. Edwards, managing director of the Grosvenor House Hotel.

Success depended on the designer's ability to combine small field performance with high cruising speed and long range, a requirement brilliantly met by the imaginative use of a thin wing, split trailing edge flaps, variable pitch airscrews and a manually retractable undercarriage. A crew of two, essential when flying long stages, was seated in tandem to reduce frontal area and for reliability the aircraft was fitted with special low drag Gipsy Six R high compression racing engines rated at 230 h.p. each at take off. The Comets were built in great secrecy at Stag Lane and after trial erection the components were taken by road to Hatfield for final assembly and test. Even the owners were not allowed to see them but de Havillands were as good as their word and the first Comet, actually the Mollisons' *G-ACSP*, flew at Hatfield under B conditions as *E-1* piloted by H. S. Broad on September 8, 1934, just six

weeks before the race. It was then revealed as a small twin engined, low wing monoplane of wooden stressed skin construction having a gracefully tapered wing of R.A.F. 34 section, planked with laminations of spruce strip, a method of construction devised by A. E. Hagg to obtain a thin, yet stiff cantilever. Three large fuel tanks situated in the fuselage ahead of the crew gave an ultimate range of 2,925 miles at 220 m.p.h. and Ratier two-position airscrews were fitted to give optimum take off performance. They changed automatically into coarse pitch at 150 m.p.h., at which speed a disc on the spinner was forced back to release the 80 lb. of internal air pressure, but a return to fine pitch could only be made on the ground with the aid of a bicycle pump before each flight.

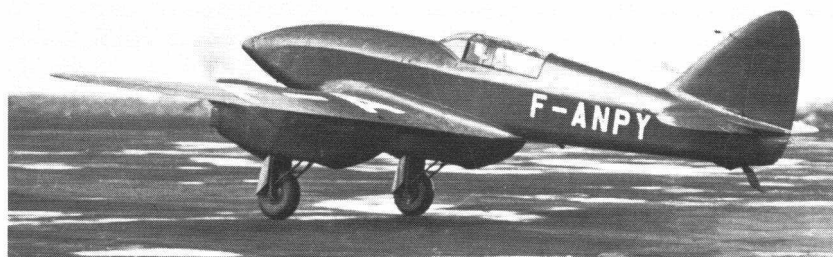
Each Comet boasted distinctive racing colours, the Mollisons' "Black Magic" *G-ACSP* was black and gold; Bernard Rubin's 'SR', flown by Owen Cathcart-Jones and Ken Waller was green and nameless; and 'SS', aptly named "Grosvenor House" and flown by C. W. A. Scott and Tom Campbell Black was scarlet and white. After intensive test flying, fuel consumption tests and crew training, all three Comets checked in at Mildenhall on October 14th, but on the 18th Cathcart-Jones damaged 'SR' by landing from a test flight with the undercarriage only partially lowered. Chief damage was to undercarriage fairings and to the Ratier airscrews but the latter were straightened by the Fairey Aviation Co. Ltd. after which fanatical repair work had the machine back in the air 12 hours before the start. The now immortal MacRobertson Race started from Mildenhall at dawn on October 20, 1934 and by the end of the first day the Mollisons, Scott and Black had covered the 2,530 miles to Baghdad. The Mollisons made it nonstop but 'SS' refuelled at R.A.F. Kirkuk and Cathcart-Jones and Waller lost their way, making a forced landing at Dizful in the Persian desert, 240 miles to the south east. Nevertheless they overtook the Mollisons at Allahabad where 'SP' had retired from the race with engines damaged by the use of commercial motor spirit. By that time Scott and Black were well beyond Singapore but only superhuman



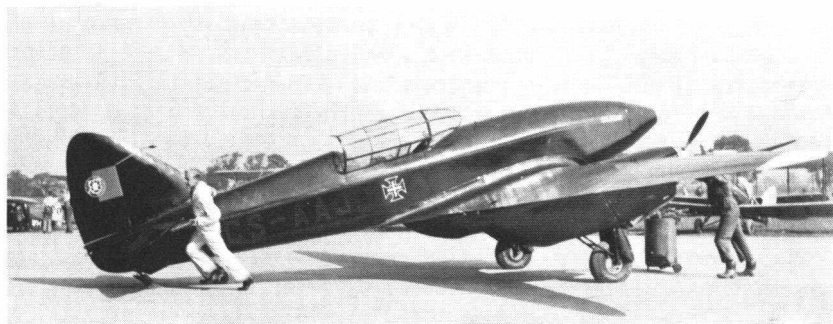
The famous MacRobertson Race winning Comet, c/n 1996, in R.A.F. colours as K5084.

efforts to overcome fatigue enabled them to keep ahead of the K.L.M. Douglas DC-2 and arrive first in Melbourne to win the speed prize in an elapsed time of 70 hours 54 minutes 18 seconds.

Cathcart-Jones and Waller arrived fourth in 108 hours 13 minutes 30 seconds, collected news reels and press photographs of the finish and took off at once for England. They arrived at Lympne on November 2nd, 13 days 6 hours 43 minutes after leaving Mildenhall and set up a new out-and-home record. Suitably named "Reine Astrid" the same aircraft left Evere, Brussels on December 20th piloted by Ken Waller and Maurice Franchomme carrying the Christmas mail to the Congo. They arrived back from Leopoldville on the 28th at the end of an 8,000 mile round trip, after which the Comet returned to Hatfield for overhaul and sale to the French Government as *F-ANPY*. In the course of delivery from Croydon to Le Bourget on July 5, 1935 H. S. Broad reduced the inter-capital time to under an hour and established a new record of 52 minutes. The Comet was purchased for experimental work in preparation for a projected high speed South Atlantic air mail service. Accompanied by radio operator Gimie, the famous French long distance pilot Jean Mermoz made a record breaking proving flight from Paris to Dakar in 'PY on August 1-2,



Comet *F-ANPY* leaving Croydon for Le Bourget on delivery to the French Government, July 5, 1935. ('The Aeroplane' Photo.)



The original D.H.88 Comet, c/n 1994, in Portuguese marks as *CS-AAJ* "Salazar".

1935 in the course of which he covered the 1,420 miles to Casablanca in 7 hours 22 minutes and the remaining 1,570 miles on the second day in 8 hours 19 minutes at an average speed of 193 m.p.h. He raised this to 208.5 m.p.h. for the return journey on August 29-30th and on September 6th the same aircraft and crew flew from Paris to Algiers and back in a day in a flying time of 8 hours 38 minutes at an average speed of 201.3 m.p.h. A fourth Comet, *F-ANPZ*, constructed to French Government order to assist in this work, was fitted with D.H./Hamilton variable pitch airscrews and a mail compartment in the nose and thus did not have the landing light. It was the first aeroplane with airframe, engines and airscrews all D.H. built and was delivered from Croydon to Le Bourget by Hugh Buckingham in 59 minutes.

The Portuguese Government had similar mail-carrying ideas and acquired "Black Magic" for a projected proving flight from Lisbon to Rio de Janeiro. Renamed "Salazar", it was ferried from Hatfield to Lisbon on February 25, 1935 by Senor Carlos Bleck and Lt. Costa Macedo who covered the 1,010 miles nonstop in 6 hours 5 minutes. A return trip was made in the following September and in 1937 Macedo again brought the aircraft back to Hatfield for overhaul and made an outstanding return flight to Lisbon in 5 hours 17 minutes in July of that year. A fifth and final Comet, *G-ADEF* "Boomerang", was built to the order of Cyril Nicholson who planned a series of attempts on the major long distance records. Piloted by Tom Campbell Black and J. C. McArthur it made a record Hatfield-Cairo nonstop flight of 2,240 miles in 11 hours 18 minutes on August 8, 1935 during the first stage of an attempt on the Cape record. This was abandoned through oil trouble and the machine returned nonstop in 12 hours 15 minutes and established a new out-and-home record to Cairo. Although entered in the King's Cup Race of September 7, 1935 "Boomerang" was a non-starter and left a fortnight later for a second attempt on the Cape record but airscrew trouble over the Sudan on September 22nd compelled the crew to abandon the aircraft by parachute.

Official interest in the Comet resulted in "Grosvenor House", shipped back from Melbourne, being taken over by the Air Ministry and sent to Martlesham for trials during which enlarged air intakes were fitted to replace those damaged when the undercarriage failed to lock down on August 30, 1935. It appeared with this modification as *K5084* at the Hendon R.A.F. Display on June 27, 1936 but the undercarriage failed again on September 2nd during landing tests at an all-up weight of 5,000 lb. and it was put up for disposal as scrap. Oblivion was prevented by F. E. Tasker, for whom this famous aeroplane was rebuilt by Essex Aero Ltd. at Gravesend, who fitted Gipsy Six series II engines driving D.H./Hamilton variable pitch airscrews. Painted pale blue and renamed "The Orphan", *G-ACSS* came fourth in the 1937 Marseilles-Damascus-Paris race piloted by A. E. Clouston and George Nelson and on September 11th, Ken Waller flew it into 12th place in the King's Cup Race at Hatfield.



Tom Campbell Black's Comet "Boomerang" at Hatfield on King's Cup Day, September 7, 1935. (W. K. Kilsby Photo.)

In those days advertising played an important part in financing record breaking flights, so that when Clouston and Mrs. Kirby Green left Croydon to break the out-and-home Cape record on November 14th, the veteran *G-ACSS* had been renamed "The Burberry". The record was successfully lowered to 15 days 17 hours for the round trip, and adorned with yet another name—"Australian Anniversary"—it left Gravesend for Australia on February 6, 1938 but an eventful flight terminated in Cyprus with a collapsed undercarriage. Temporary repairs enabled it to be flown home for one last historic flight. With Clouston and Victor Ricketts as crew, 'SS took off from Gravesend on March 15th, reached Sydney in 80 hours 56 minutes and then crossed the Tasman Sea to Blenheim, New Zealand in 7½ hours. After an overnight stop the Comet set off on the return journey and when it touched down at Croydon on the 26th, 26,450 miles had been covered in 10 days 21 hours 22 minutes to create a record which still stands. The aircraft then returned to Essex Aero Ltd. at Gravesend where it donated an engine to Alex Henshaw's long distance Mew Gull *G-AEXF*, afterwards remaining under tarpaulins for 13 years until students of the de Havilland Technical School restored it to the original "Grosvenor House" condition for display at the 1951 Festival of Britain Exhibition. Later, still with only one engine installed, the historic aircraft which provided so much data for the D.H.98 Mosquito of the Second World War, was preserved in the showrooms of the de Havilland Engine Co. Ltd. at Leavesden. On October 30, 1965, it was handed over to the Shuttleworth Trust and taken to Old Warden where overhaul to flying condition began in 1976, a task that would take eleven years to complete.

SPECIFICATION AND DATA

Manufacturers: The de Havilland Aircraft Co. Ltd., Stag Lane Aerodrome, Edgware, Middlesex

Power Plants: Two 230 h.p. de Havilland Gipsy Six R
Two 205 h.p. de Havilland Gipsy Six series II

Dimensions: Span 44 ft. 0 in. Length 29 ft. 0 in.
Height 10 ft. 0 in. Wing area 212½ sq. ft.

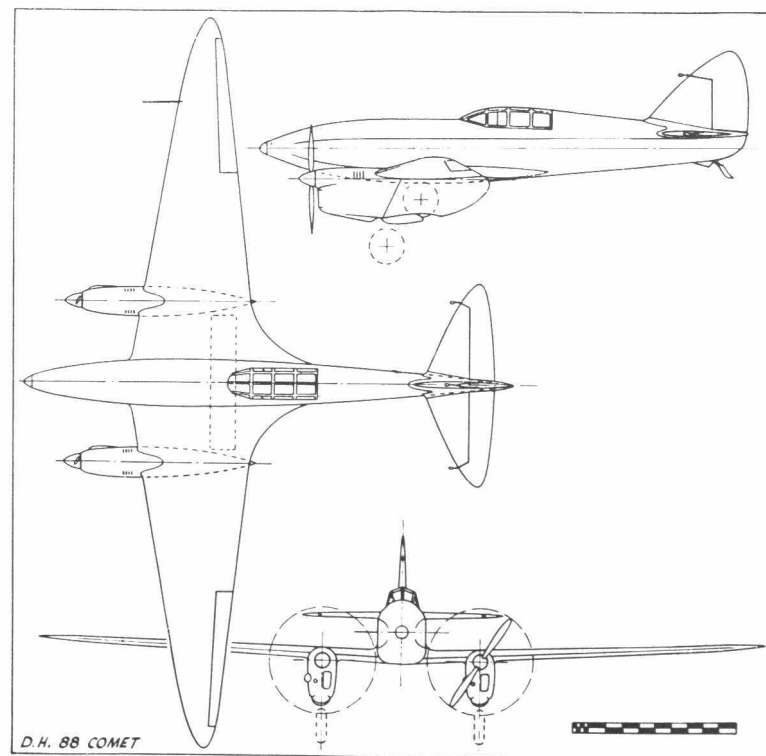
Weights: Tare weight 2,930 lb. All-up weight 5,550 lb.

Performance: Maximum speed 237 m.p.h. Cruising speed 220 m.p.h.
Initial climb 900 ft./min. Ceiling 19,000 ft.
Range 2,925 miles

Production:

	Constructor's No. and Registration	C. of A. Issued	Remarks
1994	<i>G-ACSP</i>	9.10.34	"Black Magic"; to the Portuguese Government 3.35 as <i>CS-AAJ</i> "Salazar", first flown as <i>E-1</i>
1995	<i>G-ACSR</i>	12.10.34	First flown 12.10.34; "Reine Astrid"; to the French Government 4.35 as <i>F-ANPY</i>
1996	<i>G-ACSS</i>	12.10.34	First flown 9.10.34; "Grosvenor House"; to the R.A.F. 6.35 as <i>K5084</i> , restored 6.37, preserved by the Shuttleworth Trust
2260*	<i>F-ANPZ</i>	26. 6.35	French Government mailplane, first flown as <i>E-1</i>
2261	<i>G-ADEF</i>	6. 8.35	"Boomerang"; first flown 3.6.35 as <i>E-3</i> ; crashed south of Atbara, Sudan 22.9.35

* Originally 1999.





The prototype D.H.89 Dragon Rapide *E-4/CH-287*, c/n 6250, showing the original windows. ('Flight' Photo 14105.)

De Havilland D.H.89 Dragon Rapide

Designs for a faster and more comfortable Dragon commenced late in 1933, resulting in a scaled down, twin engined version of the high performance D.H.86, employing the same type of fuselage construction, tapered mainplanes, nacelles and trousered undercarriage. Designated D.H.89, it was powered by two Gipsy Six engines which at once suggested Dragon Six as the obvious type name, a throw back to the outmoded system used long ago for the Puss and Hawk Moths. When series production began at Hatfield, constructor's number block commencing 6250 was allocated and the type name became Dragon Rapide, but the faithful old biplane was a mainstay of world commercial aviation for so long that it became known everywhere simply as the Rapide. During the ten years it was in production, 728 were built and it is true to say that no real replacement has ever been found.

E-4, the prototype, first flown at Hatfield by H. S. Broad on April 17, 1934 was sold as *CH-287* to the Ostschweiz Aero Gesellschaft at St. Gallen for transporting winter sports enthusiasts from Zürich to St. Moritz. In 1960, at the age of 27, it was still joyriding as *HB-APA* but then had a non-standard pilot's windscreen and the longer rear windows which were a feature of all production Rapides. Hillmans Airways Ltd., first operators of the Dragon, were also first British purchasers of the Rapide, their first aircraft, *G-ACPM*, making a public debut at Hatfield on July 13, 1934 when H. S. Broad flew it in the King's Cup Race and averaged 158 m.p.h. before retiring with hail damage. Railway Air Services Ltd. also bought Rapides for trunk routes between Croydon,

Speke, Renfrew and Belfast and for summer services between Speke, Whitchurch, Eastleigh and Shoreham, each aircraft being named as under—

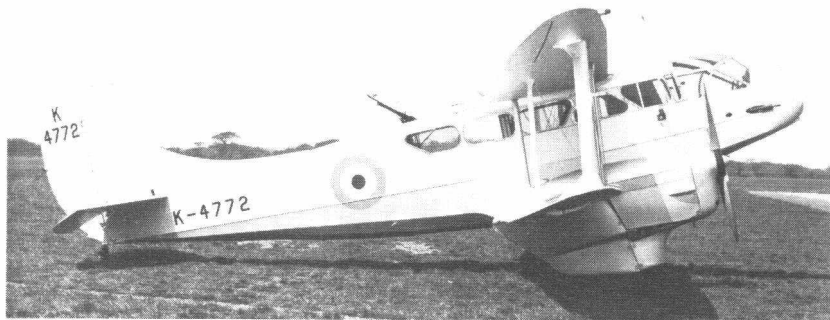
<i>G-ACPP</i>	"City of Bristol"	<i>G-AEAL</i>	"Star of Yorkshire"
<i>G-ACPR</i>	"City of Birmingham"	<i>G-AEAM</i>	"Star of Ulster"
<i>G-AEAJ</i>	"Star of Lancashire"	<i>G-AEBW</i>	"Star of Renfrew"
<i>G-AEAK</i>	"Star of Mona"	<i>G-AEBX</i>	"Star of Scotia"

Jersey Airways Ltd. acquired two Rapides *G-ADBV* and *'BW* but named only the first, "St. Ouens Bay II", while the Hillman fleet *G-ACPM-PO* and *G-ADAH-AL*, remained unnamed. The 1936 Rapide, commencing *G-ADWZ*, had a nose landing light, thickened wing tips and cabin heating and was cleared for take off at 5,500 lb. A.U.W. In 1937, commencing *G-AEOV*, small trailing edge landing flaps were fitted under the lower mainplane outboard of the nacelles, a modification which gave rise to the amended designation D.H.89A, to which standard many earlier aircraft were brought during overhaul. In 1936 a levered suspension undercarriage was tried experimentally.

Specification G.18/35 for a Coastal Command General Reconnaissance aircraft was met by fitting a standard Rapide with a Mk. V Vickers gun on the starboard side of the nose, a bomb bay for two 100 lb. and four 20 lb. bombs, one Lewis gun Mk. III on a patent D.H. gun mounting on top of the rear fuselage, extra cabin windows and a long curved dorsal fin. The crew of three comprising pilot, wireless operator/gunner, and navigator/bomber were provided with a Youngman dinghy in the top centre section. The single prototype, *K4227*, designated D.H.89M, was passed over in favour of the Anson but the design effort was not wasted as three modified D.H.89Ms were delivered to the Spanish Government in December 1935 for police duties in Morocco. A Vickers E gun was fitted in the nose, a Spanish designed bomb sight was built into the floor and twelve 27 lb. Spanish Government standard bombs were carried in a rack under



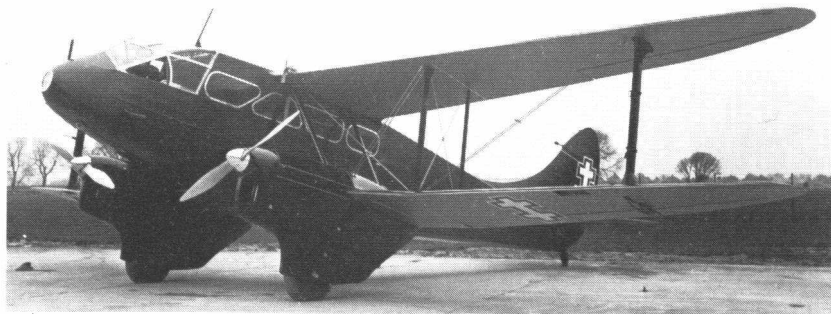
Hillmans Airways' blue and white Rapide *G-AJAJ* at Le Zoute in 1935. (Guy Destrebecq Photo.)



The D.H.89M coastal reconnaissance aircraft K4772, c/n 6271. ('Flight' Photo 11456.)

the fuselage. The mid-upper gunner was provided with a Vickers F gun and a second fired downwards through the floor. When the civil war began in 1936 they were formed into Grupo 40 commanded by Capt. J. A. Anslado and operated on the Nationalist side as 40-1 "Capitán Pouso", 40-2 "Capitán Vela" and 40-3 from bases at Logiono, Burgos and Saragossa. In 1936 two further D.H.89Ms were built for the Lithuanian Government.

A standard Rapide, K5070, added to the strength of No. 24 Squadron, Hendon in 1935 as an Air Council V.I.P. transport, was housed with King Edward VIII's royal Rapide G-ADDD. In 1938 P1764 and '65 were acquired for communications duties to Specification 21/38 and three trainers, R2485-'87 for No. 2 Electrical and Wireless School to Specification T.29/38. A single Rapide, A3-1, was supplied to the R.A.A.F. for survey work and this survived the war to serve in the outback as VH-UFF until 1958. "Tainui", ZK-ACO, was purchased by the New Zealand Melbourne Centenary Air Race Committee and in the hands of J. D. Hewett and C. E. Kay, finished fifth in the MacRobertson Race in 13 days 18 hours 51 minutes and later went into airline service in New Zealand and Australia. One early example went to Lineas Aereas Postales Espanolas in



One of the D.H.89Ms, c/n 6348-6349, supplied to the Lithuanian Air Force with Cs. of A. dated April 14, 1937.

Spain, another to the Italian airline Ala Littoria and three to the Asiatic Petroleum Co. Ltd. for oil prospecting in Netherlands New Guinea. T. J. Mahieu's OO-JFN and the Maharajah of Jammu's VT-AHB were acquired privately and several were despatched to de Havilland Aircraft of Canada Ltd., the first of which, CF-AEO, was equipped with Fairchild floats and the long dorsal fin before delivery to Canadian Airways Ltd. Four others were ski-equipped for the Rimouski-Hannington service of Quebec Airways Ltd. As one of the world's most widely used transports, the Rapide also flew in the colours of Alpar; Aer Lingus; Transports du Proche Orient, Paris; the Turkish, Persian, Rumanian and Jugoslavian State airlines; the Chinese ambulance service; P.L.U.N.A. in Uruguay; Wilson Airways Ltd. in Kenya; Rhodesia and Nyasaland Airways Ltd.; Union



A Canadian Rapide CF-AYE, c/n 6304, on Edo floats, and fitted with compensatory dorsal fin. The prototype float installation made to Rapide CF-AEO had additional struts forward. (B. Van Sickle Photo.)

Airways of New Zealand; Wearnes Air Services Ltd. in Singapore; Indian National Airways Ltd.; and transport companies in Australia, Finland, Portuguese East Africa and South Africa. The last civil delivery before the outbreak of war was the 205th aircraft, VT-ALO, for Tata Airlines Ltd., Bombay.

British owned Rapides ranged far over Europe and the Near East in the service of charter firms such as Olley Air Service Ltd., whose G-ACYR was chartered by autogiro pioneer Juan de la Cierva and newspaperman Luis Bolin and flown to Las Palmas, Canary Islands, by Capt. C. W. H. Bebb to pick up the Governor, General Franco, and fly him to Tetuán in Spanish Morocco to assume command of the Spanish forces at the beginning of the civil war. It arrived on July 19, 1936 after a night stop at Casablanca, returned to England and saw service on the internal air routes during the Second World War. It was presented to General Franco as a souvenir in 1953 and was still hangared in Spain in 1972.

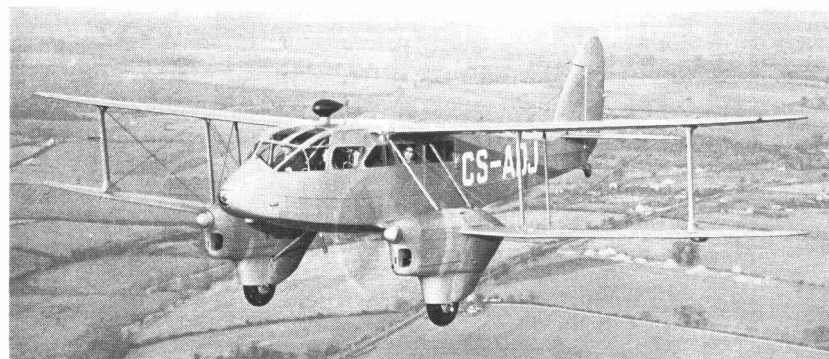
A considerable number of Rapides were used as flying classrooms at the Shoreham and Perth air navigation schools of Airwork Ltd. and others patrolled the desert pipelines of the Iraq Petroleum Transport Co. Ltd. In May–June 1940 nine were lost while ferrying supplies to the British forces in France, after which the majority were impressed for duty with Air Transport Auxiliary and the air forces and navies of Britain and the Commonwealth. Fourteen were camouflaged to continue in a civil capacity with blanked off windows on essential services in Scotland, and a number of others performed similar duties in New Guinea, India and New Zealand.

To supplement impressments, production was stepped up at Hatfield and the Rapide took on a new lease of life as the D.H.89B Dominie Mk. 1 navigation and W/T trainer or Mk. 2 communications aircraft, the former externally identified by the roof-mounted D/F loop. North Eastern Airways' *G-AFEP* and Wrightways' *G-AFEZ* were impressed into the Fleet Air Arm which, between 1940 and 1945, also took delivery of 63 Dominie Mk. 1 and 2. Remaining production was for the R.A.F., A.T.A. and U.S.A.A.F. units in Britain, but one was released to the Anglo Iranian Oil Co. Ltd. as *G-AGFU*, one to Canada as *CF-BNG* and five to Scottish Airways Ltd. for increased priority traffic to the Hebrides and Shetlands. In 1941 one Dominie was taken on charge at Hatfield as a works 'hack' under B conditions as *E-0228*.

By 1942 annual output had reached 185 machines but all Hatfield factory space was then required for the Mosquito and the Dominie assembly line was transferred to Brush Coachworks Ltd. at Loughborough where a further 346 were built between 1943 and 1945. The last 100 production aircraft, too late for military service, were furnished to civil standards by the de Havilland Repair Unit at Witney and disposed of as normal Rapides. This batch formed the initial postwar equipment of K.L.M., the Anglo Iranian Oil Co. Ltd., Iraqi Airways Ltd., Jersey Airways Ltd. and the Danish ambulance service, while others were despatched to the Lebanon, Brazil, Portugal, Sweden and Transjordan.

Eight, including *OB-RAA* to 'AE' and 'AG', were shipped to Peru and assembled in extreme heat in a Government factory at Callao. The first three were climbed to 17,000 ft. in order to overfly the Andes en route to their base aerodrome in the hinterland and two others were put on D.H. Canada float undercarriages. After acceptance tests on the first one at a naval base near Lima, the second was flown to the jungle city of Iquitos and there equipped with floats for use on the Amazon River.

Hundreds of surplus Dominies were disposed of after the war among which were found a considerable number of pre-war civil Rapides. With roughly daubed civilian marks they flew away from Maintenance Units for conversion by the purchaser, or via de Havilland's Witney production line which assembled two additional aircraft from spares in 1947. There were far too many for British requirements and the large surplus was sold in almost every country of the free world. An attempt was also made to re-use and extend the Dominie mark numbers, the six passenger version



CS-ADJ, one of three Witney conversions delivered to Lisbon in November 1945 for internal routes in Portugal.



Loughborough-built D.H.89B Dominie C. Mk. 2 *NR680*. Civil in 1948 as *G-AKSC*, it was sold in New Caledonia in 1955 as *F-OATC*.



B.E.A. Islander Class Rapide *G-AGSH* "James Keir Hardie". (B.E.A. Photo.)

with pilot and radio operator being Mk. 2 as in Dominie days, while Mk. 3 denoted the alternative version for pilot and eight passengers. These designations were seldom used in practice.

One of the largest Rapide fleets ever formed flew on the Scottish, Scilly and Channel Islands routes of British European Airways Corporation, which in 1950 grouped the survivors into the Islander Class with the individual names given below—

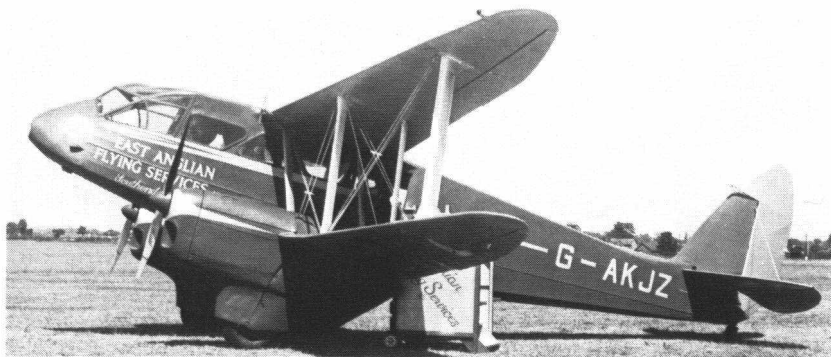
<i>G-AFEZ</i> "Lord Shaftesbury"	<i>G-AHKS</i> "Robert Louis Stevenson"
<i>G-AFRK</i> "Rudyard Kipling"	<i>G-AHKT</i> "Lord Tennyson"
<i>G-AGPH</i> "Sir Henry Havelock"	<i>G-AHKU</i> "Cecil John Rhodes"
<i>G-AGSH</i> "James Keir Hardie"	* <i>G-AHKV</i> "Sir James Outram"
<i>G-AGSK</i> "Lord Kitchener"	** <i>G-AHLL</i> "Sir Henry Lawrence"
<i>G-AGUP</i> "Sir Robert Peel"	* <i>G-AHXW</i> "John Nicholson"
<i>G-AGUR</i> "Lord Roberts"	<i>G-AHXX</i> "Islander"
<i>G-AGUU</i> "Sir Colin Campbell"	<i>G-AJXB</i> "William Gilbert Grace"
<i>G-AGUV</i> "General Gordon"	<i>G-AKZB</i> "Lord Baden Powell"

* Name not painted on aircraft.

** Name transferred to *G-AJCL* following accident at St. Just 21.5.59.

The R.A.F.'s last remaining Dominies were declared obsolete in June 1955 and disposed of by public tender and in their declining years were used for communications by major British aircraft manufacturers and for pleasure, charter or feeder line flying all over the world. Its well loved throaty music was as familiar in the remote interior of Venezuela as it was on the inter-island services of Fiji Airways Ltd., among the tiny French islets in the distant Pacific or on West Coast Airways' sight seeing tours over the Franz Josef Glacier in New Zealand.

Practically every postwar Rapide was powered by the surplus R.A.F. Gipsy Queen 3 engine but a Mk. 4 aircraft fitted with Gipsy Queen 2s driving constant speed airscrews, had long been envisaged. This conversion was not made until 1953 when Flightways Ltd. of Eastleigh made the prototype installation in *G-AHGF* and promptly sold it in New Zealand.



The red and silver *G-AKJZ*, one of four Rapides with which East Anglian Flying Services Ltd. maintained the Southend-Jersey service in the 1950s. (A. J. Jackson Photo.)



Rapide 4 *G-ANET*, c/n 6700, supplied to Aden Airways Ltd. in 1955, showing the enlarged air intakes and v.p. airscrew spinners of the Gipsy Queen 2 installation.

(R. A. Cole Photo.)

With these engines the Rapide was cleared for take off at an increased weight of 6,000 lb. and had a worthwhile improvement in climb, cruising and single engine performance. Many Rapides were thus modified and could be identified by their large spinners and healthy take off roar. A one-off conversion made by de Havillands to one of its communications Rapides *G-AHKA* in 1948, was known as the Mk. 5 with manually operated variable pitch airscrews fitted to special Gipsy Queen 3 M.V.P. engines. Ten years later in 1958, the X5 fixed pitch metal airscrew was specially developed for the Rapide by the Fairey Aviation Co. Ltd. It imparted an improved performance similar to that of the Mk. 4 but without the increased cost and maintenance of variable pitch mechanisms. Rapides modified in this way were known as Mk. 6, the first of which was *G-APBM*, produced by Air Couriers (Transport) Ltd. of Croydon in 1958.

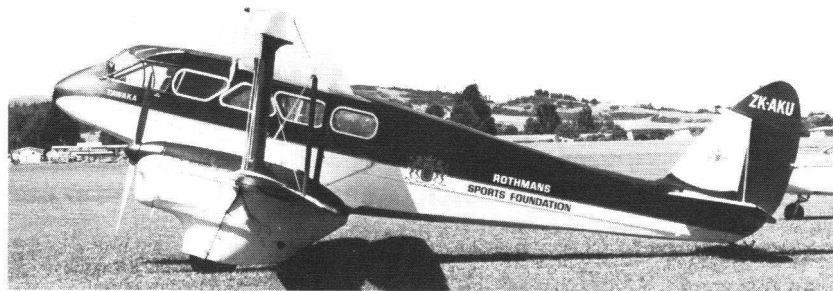
Although the Dominie had long since disappeared from the R.A.F., there were still 14 on Admiralty charge in 1961, three of which, *NF847*, *867* and *881* were kept in airworthy state, mainly for cadet flying.

In 1962 Rothmans of Pall Mall Ltd. provided the Army Free Fall Parachute Association with Rapides *G-AGTM*, *G-AJHO*, *G-AKIF* and *G-ASRJ* painted in silver and blue and emblazoned with the sponsor's crest. One was stationed in Germany and the others at Netheravon. Similarly decorated, D. W. Gray's former New Zealand National Airways Rapide *ZK-AKU* "Tawaka" was used by parachutists 'down under' and Rothmans also made *G-AKIF* available to the Norwegian Paralift organisation as *LN-BEZ* 1971-1973.

After standing 20 years in the hangar at Dyce, Rapides *G-ADAH* and *G-AJGS* were taken by road to Booker in 1967 where 'GS flew again in

February 1968. Two years later it was sold to Fritz Ludington at Miami, Florida and was ferried from Halfpenny Green via Iceland, Greenland and Labrador by E. Wein and C. D. Downes in August 1970. It was followed by the former B.E.A. *G-AHXW* (ex *NR683*) which was flown to San José, California early in 1971 for J. R. O'Brien as *N683DH*. Two others flown at displays as back-up to the growing number of American-owned Tiger Moths were *N8053* (once *G-ALGE*, *EI-AMN* and *F-BLXX*) and *N89DH*.

The unairworthy Allied Airways Rapide *G-ADAH* "Pioneer" went north by road in 1974 for exhibition by the Royal Scottish Museum at East Fortune. Earlier that year the veteran *4R-AAI* (ex *G-ALXT*), now part of the Science Museum Collection of Transport Aircraft, flew home from Sri Lanka to Biggin Hill piloted by Mr. Garry Studd. The one-time East African Airways *VP-KEF*, which in 1973 had been in service in the Seychelles with Air Mahe as *5H-AAN*, also began a new lease of life on an airstrip 15 miles west of Port Elizabeth, South Africa as private aircraft of Mr. John English.



Rapide *ZK-AKU* "Tawaka" used for parachuting in Rothman's colours in New Zealand 1971. (J. M. G. Gradidge Photo.)



One of the ex-Peruvian Rapides operating with the Riego concern in Venezuela as *YV-P-BPE*. The dorsal fin and lost wheel fairings reveal its floatplane origins.



E. L. Gandar Dower's *G-AJGS* "The Vagabond", was rebuilt at Witney in 1948 using parts from the pre-war machine *G-ACZE*. It reverted to the latter marks after its return from the U.S.A., and rebuild, in 1986. (A. J. Jackson Photo.)

SPECIFICATION AND DATA

Manufacturers: The de Havilland Aircraft Co. Ltd., Hatfield Aerodrome, Herts.
Brush Coachworks Ltd., Loughborough, Leicestershire
The de Havilland Repair Unit, Witney Aerodrome, Oxford

Power Plants: (D.H.89 and D.H.89 M) Two 200 h.p. de Havilland Gipsy Six
(D.H.89A Mk. 1, 2, 3 and 6) Two 200 h.p. de Havilland Gipsy Queen 3
(D.H.89A Mk. 4) Two 200 h.p. de Havilland Gipsy Queen 2
(D.H.89A Mk. 5) Two 200 h.p. de Havilland Gipsy Queen 3 M.V.P.
(D.H.89B Mk. 1 and 2) Two 200 h.p. de Havilland Gipsy Queen 3

Dimensions: Span 48 ft. 0 in. Length 34 ft. 6 in.
Height 10 ft. 3 in. Wing area 336 sq. ft.

Weights and Performances:

	Prototype	D.H.89	D.H.89A and D.H.89B	D.H.89A Mk. 4 and Mk. 6
Tare weight . . .	3,076 lb.	3,346 lb.	3,276 lb.	3,230 lb.
All-up weight . . .	5,000 lb.	5,500 lb.	5,500 lb.	6,000 lb.
Maximum speed . . .	—	157 m.p.h.	157 m.p.h.	150 m.p.h.
Cruising speed . . .	—	132 m.p.h.	132 m.p.h.	140 m.p.h.
Initial climb . . .	1,050 ft./min.	1,000 ft./min.	867 ft./min.	1,200 ft./min.
Ceiling . . .	—	19,500 ft.	19,500 ft.	16,000 ft.
Range . . .	578 miles	578 miles	578 miles	520 miles

	D.H.89A Mk. 5	D.H.89M	D.H.89A Seaplane
Tare weight . . .	—	3,368 lb.	3,400 lb.
All-up weight . . .	5,750 lb.	5,372 lb.	5,500 lb.
Maximum speed . . .	145 m.p.h.	151 m.p.h.	145 m.p.h.
Cruising speed . . .	141 m.p.h.	125 m.p.h.	123 m.p.h.
Initial climb . . .	955 ft./min.	890 ft./min.	700 ft./min.
Ceiling . . .	—	17,700 ft.	—
Range . . .	—	550 miles	530 miles

(a) Hatfield Rapides

Constructor's Numbers	Aircraft markings
6250-6275	CH-287, G-ACPM-'PR, ZS-AES, G-ACTT, 'TU, ZK-ACO, I-DRAG, G-ACYR, EC-W27, G-ADAL, G-ACZE, VH-UVS, G-ADAG, K5070, G-ACZF, 'YM, A3-1, K4772, G-ADAE, OO-JFN, G-ACZU, G-ADAO, G-ADAJ, 'CL, 'AH, CF-AEO, G-ADBU, 'AK, 'DE, 'DD, 'DF, VP-YAU, G-ADBV, 'AI, 'BW, 'BX, 'FX, 'FY, PH-AKV, G-ADIM, PH-AKW, CF-AVJ, PH-AKU, G-ADNG, SU-ABP, 'BQ, G-ADNH, G-ADNI, SU-ABR, 'BS, CF-AYE, ZK-AED, 'EE, CF-BBC, VT-AHB, G-ADWZ, 'YK-'YM, SU-ABU, VH-UVG, G-ADUM-'UO for Turkey, VH-UVI, 'VT, G-AEAI, Spanish D.H.89M (3), G-AEAK-'AM
6276-6300	G-AEBW, 'BX, YR-DRA, 'DRI, 'DRO, G-AEKF, CX-ABU, ZK-AEC, G-AEGS, 'MH, 'ML, YR-NDC, G-AEMM, 'NN, 'NO, 'OV, ZK-AEW, G-AEPE, 'RN, VH-UXT, OH-BLA, Lithuanian D.H.89M (2), G-AEPW
6301-6326	YL-ABC, 'BD, G-AEPF, CF-BBG, G-AERE, 'RZ, VP-KCG, VP-YBJ, 'BK, VR-SAV, CR-AAD, 'AE, G-AESR, VR-SAW, VH-UXZ, VP-KCJ, G-AEWL, 'XO, 'XP, CF-BBH, 'FM, G-AFAO, CF-BFL, 'FP, 'ND, 'NE
6327-6350	G-AFAH, VT-AIZ, 'JA, ZS-AKT, VT-AJB, F-AQIL, 'IM, VH-UZY, China, G-AFFF, ZS-AME, South Africa, China (4), F-AQIN, VP-KCL, F-AQJH, 'JI, CR-AAM, 'AN, G-AFEN
6351-6376	OH-BLB, G-AFEY, F-AQOH, VP-YBT, G-AFEO, 'EP, F-AQOI, G-AFEZ, 'FB, 'FC, ZS-AOM, VP-YBU, VP-KCR, YI-ZWA, 'HDA, 'FYA, G-AFHY-'IA, F-ARII, P1764, '65 to A.M. Contract 808642/38, ZK-AGT, F-ARIJ, 'IK
6377-6399	G-AFLY, F-ARIL, 'IM, G-AFLZ, 'MA, 'ME-'MJ, HB-AME, 'MU, CR-AAT, 'AU, G-AFRK, 'NC, 'ND, China, G-AFSO, R2485-'87 to A.M. Contract 981944/39, PP-LAA, G-AFOI, CR-LAV, 'AU, 'AT, VT-ALO, P9588, '89 to A.M. Contract 9869
6401-6425	
6426-6456	

Note—for c/n 6400 see D.H.92

(b) Hatfield Dominies

6457-6461	R5921 to R5925	6493-6527	X7320 to X7354
6462	experimental airframe	6528-6577	X7368 to X7417
6463-6471	R5926 to R5934	6578-6583	X7437 to X7442
6472	CF-BNG	6584	G-AGDM
6473-6492	R9545 to R9564	6585-6598	X7443 to X7456
		6599-6642	X7482 to X7525

(c) Loughborough Dominies

6643-6674	HG644 to HG675	6892-6917	NR828 to NR853
6675-6717	HG690 to HG732	6918-6950	RL936 to RL968
6718-6767	NF847 to NF896	6951-6957	RL980 to RL986
6768-6800	NR669 to NR701	6958-6978	TX300 to TX320
6801-6844	NR713 to NR756	*6979-6983	TX326 to TX330
6845-6891	NR769 to NR815	*6984-6988	TX336 to TX339, TX361

* Contract for last ten aircraft cancelled.

(d) Witney rebuilds

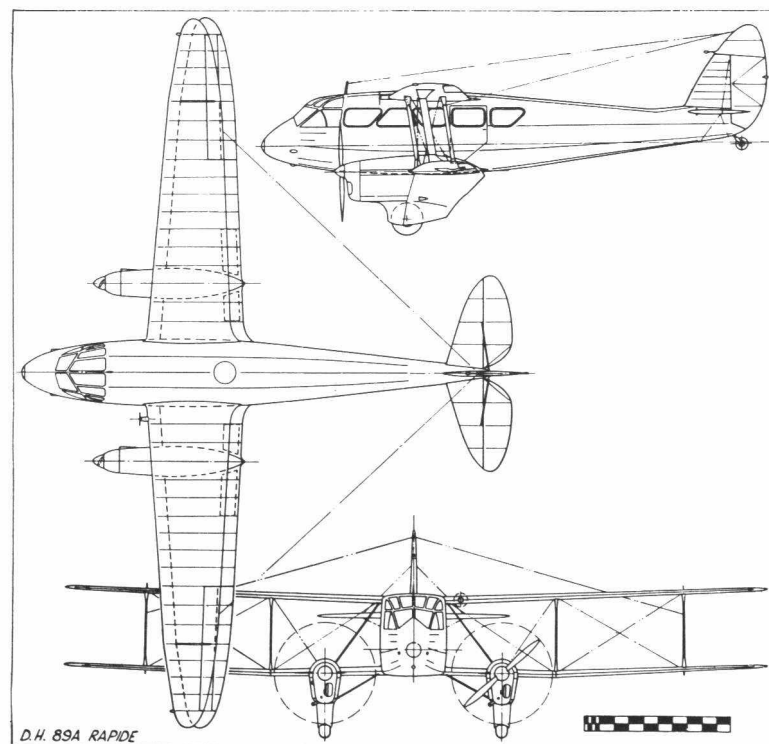
W.1001-W.1002	G-AJGS, G-AKJS
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(e) Witney conversions

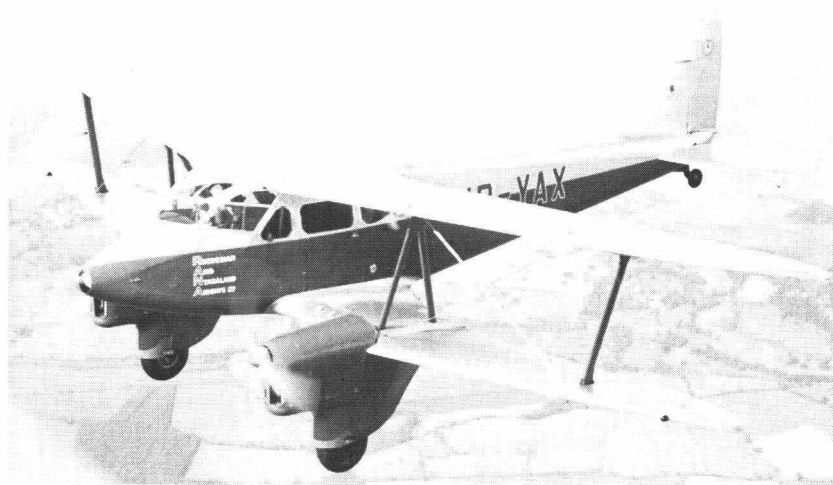
Constructor's Numbers	Aircraft markings
6884-6901	G-AGSH, 'PI, 'SI, 'SK, 'SJ, 'PH, PH-RAA, 'AB, G-AKZA*, PH-RAC, LR-AAE, PH-RAD, LR-AAF, YI-ABD, 'BE, CS-ADI-'DK
6902-6925	G-AHGG, 'GF, CR-LBN, 'BO, YI-ABF, 'BG, G-AGUU, YI-ABH, G-AGUR, 'UP, 'UV, 'ZO, ZS-ATV, 'TW, G-AGWC, 'WR, 'WP, SE-APH, PP-AIA, 'ID, 'IB, 'IC, VP-YDF, 'DE
6926-6950	G-AHAG, PP-OMB, CF-DIM, VH-BKR, G-ALAX*, G-AKSG*, G-ALAZ*, 6933**, G-AHGH, 'GI, G-AGZJ, 'ZK, Canada, 6939**, G-AKRP*, G-ALRW*, G-ALAY*, 'GN*, G-AHED, 'EB, 'EA, VT-AVW, G-AHIA, G-AKSD*, 'RR*
6951-6978	G-AKSB*, 'RS*, VT-AVX, TJ-AAA, 'AB, OY-DZY, VT-AXG, TJ-AAC, 'AD, Brazil, TJ-AAE, G-AHTS, 'PU, 'TR, 'WF, 'TT, 'JS, G-AIDL, ZS-AXS, PP-AIE-'IG, OB-RAA-'AE, 'AG

* Privately converted in 1948 but included here for completeness.

** Conversion abandoned.



D.H. 89A RAPIDE



D.H.90 Dragonfly VP-YAX, c/n 7512, of Rhodesia and Nyasaland Airways Ltd. ('Flight' Photo 13097.)

De Havilland D.H.90 Dragonfly

The Dragonfly was a tapered wing, five seat, luxury tourer outwardly resembling a scaled down Rapide but different structurally because the fuselage was a monocoque shell of pre-formed ply with light spruce stringers, a form of construction akin to that of the Comet racers and the Albatross transports. Improved performance and ease of access to the cabin was obtained by completely eliminating all struts and wires from the inner wing bay and to achieve this, exceptionally heavy duty spars were built into the lower centre section. It was thus possible to use cantilever undercarriage units built integral with Rapide-type nacelles housing two Gipsy Major engines. Fuel for 900 miles was carried in two 30 gallon tanks in the thickened lower centre section and a third holding 25 gallons was situated at the rear of the cabin, but when flying with full load, fuel was reduced to give a range of 625 miles. Dual control was provided in the two front seats and there was a double seat in the rear with a fifth occupant in the centre of the cabin.

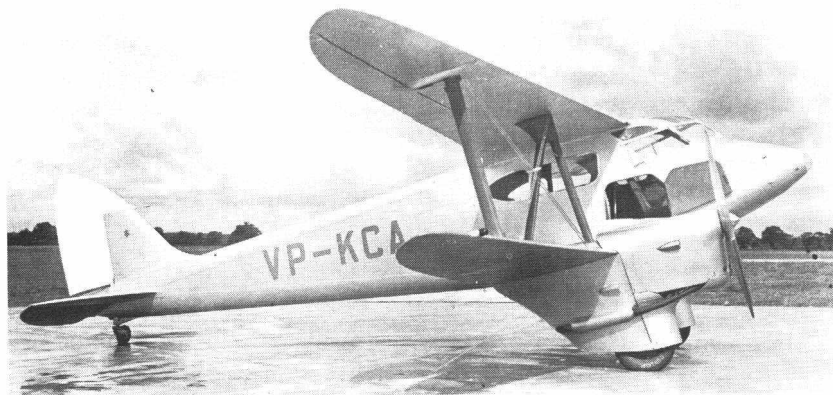
The maiden flight of the prototype, E-2/G-ADNA took place at Hatfield on August 12, 1935 and a second aircraft G-AEUB, powered by Gipsy Major IIs with provision for v.p. airscrews flew as the D.H.90A demonstrator in February 1936. It was the first of 66 production aircraft built in the 7500 constructor's number sequence. As was to be expected, the prototype was on the starting line of the King's Cup Race at Hatfield on July 10, 1936 and in the two days' racing piloted by Capt. Geoffrey de Havilland and his son Geoffrey, averaged 143.75 m.p.h. and came eighth.

The Dragonfly, which today would be classed as an executive aircraft, achieved maximum performance on low power by the use of new constructional methods, and inevitably the price was high at £2,650, so that initial sales on the British market were restricted to 21. Prominent owners of the day such as Sir Philip Sassoon, Lord Beaverbrook, Loel Guinness, and Lt. Col. E. T. Peel bought them, and Sir W. Lindsay Everard named his G-ADXM "Leicestershire Vixen II". The London Aeroplane Club acquired G-AECW for which the dual instruction charge was £5 10s. per hour and 'WZ' was used as a navigation trainer by Air Service Training Ltd., Hamble. The second production aircraft YI-HMK, specially furnished as the markings suggest, for the personal use of King Feisal of Iraq, was later joined by YI-OSD. Wealthy French owners Baron L. de Armella, Baron Jules de Koenigswater, Jacques Duprey and Gustav Wolf took delivery of F-AOZC, 'YK, F-APAX and 'DE respectively in 1936-7 while others were supplied to QANTAS; Wearnes Air Services Ltd., Singapore; Rhodesia and Nyasaland Airways; P.L.U.N.A., Uruguay; Divisao dos Transportes Aereos (DTA) in Angola; Linile Aeriene Romane Exploatate en Statul (L.A.R.E.S.), Rumania; Misr Airwork Ltd., Egypt; Ala Littoria, Italy; the Turkish State Airline; and the Swedish (local type number Tp.3) and Danish Air Forces. Others were built for private ownership and taxi work in Argentina, Belgium, Holland, India, Italy, Kenya, New Zealand, Nigeria and South Africa. As usual, de Havilland Aircraft of Canada Ltd. was responsible for conversion to Edo floats and CF-BFF was equipped in this way for Gold Belt Air Services Ltd. The Royal Canadian Mounted Police used four Dragonflies CF-MPA-'PD to combat rum-running off the Nova Scotia coast.

Only two Dragonflies were the subject of major modifications, the first being one of the company's 'hack' aircraft (believed to have been the



Dragonfly floatplane CF-BFF, c/n 7543, of Gold Belt Air Services Ltd. (B. Van Sickle Photo.)



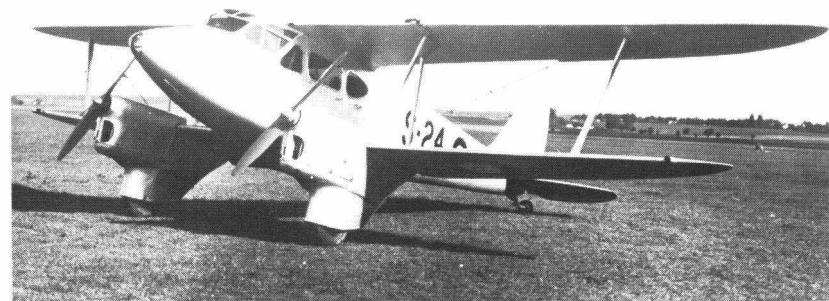
Wilson Airways' D.H.90 Dragonfly *VP-KCA* at Hatfield in September 1936 with freight door and non-standard windows.

prototype *G-ADNA*) on which the pilot's windscreen and canopy were improved by large double curvature front panels, enlarged 'eyebrow' windows and lowered side panels. The other was *VP-KCA* supplied to Wilson Airways Ltd., Nairobi in September 1936 which had one starboard window deleted and a small freight door cut in the side.

The type soon proved more suitable for commercial operation and eventually drifted away from private ownership. To assist her already extensive fleet of Dragons with the Army Co-Operation night flying contract, the Hon. Mrs. Victor Bruce collected a fleet of six Dragonflies at Croydon which included *G-AECX* which had served a year with Air Services of India Ltd. as *VT-AKC*; *G-AFRF* and '*RI*' bought secondhand from Baron L. de Armella and Jacques Duprey respectively; and '*TF*', formerly de Havilland's Australian demonstrator *VH-UXA*.

Production ceased in 1938 and in June 1940 the Dragonfly jigs were used to build a road block on the Barnet by-pass. During the Second World War six Dragonflies, including three of the R.C.M.P. machines, were impressed into the Royal Canadian Air Force as 7623-7628, and *VH-UXS* was commandeered by the R.A.A.F. as *A43-1*. Fifteen Dragonflies which suffered a similar fate in England became industrial 'hacks'. Inexplicably one of them, the former London Aeroplane Club machine, retained its civil status to serve as de Havilland's communications aircraft throughout the war.

With spares non-existent and repairs to monocoque fuselages difficult, they were progressively struck off charge until, with the return of peace, only one Canadian and one British impressee survived. They were the R.C.M.P. machine *CF-MPB* which returned to service after the war as *CF-BZA* and the former Air Service Training aircraft *G-AEWZ* which had been in continuous use as *DJ716* by Short Bros. Ltd. at Rochester. After considerable postwar service with Silver City Airways Ltd. during which it



Danish Air Force Dragonfly *S-24*, c/n 7552.

became a D.H.90A by acquiring Gipsy Major 1C engines, modern equivalent of the high compression Gipsy Major II, '*WZ*', then in its 24th year, was fitted in 1960 with Gipsy Major 1D engines for the private use of Mr. R. M. Wilson at Baginton. C. G. M. Alington bought *SU-ABW* from Misr Airwork Ltd. in 1947 and after overhaul at Gatwick flew it for a year as *G-AIYJ*, and several others which entirely evaded war service were in daily use until the 1960s. These included *CR-AAB* based in Angola by Divisao de Exploracao dos Transportes Aereos (DETA); *VH-UTJ* and '*XB*' at Alice Springs, N.T. by Connellan Airways Ltd.; *VH-AAD* at Cairns, Q. by Bush Pilots Airways Ltd.; *ZK-AFB* at Christchurch, New Zealand by the Air Charter Company and G. T. Fillery's *ZS-ANM* in South Africa. One other Dragonfly, which returned to England, had an extremely complex foreign history, having started life in France in September 1936 as



Dragonfly *G-AECW* as de Havilland's wartime communications machine in July 1940 with roundels and camouflage and yellow paint scheme. ('*The Aeroplane*' Photo.)



Dragonfly G-AEDT "Endeavour" at Prestwick on July 31, 1964 on the eve of its westbound Atlantic crossing. (Ian Stewart Photo.)

Gustav Wolf's *F-APDE*. Then it spent two decades in Belgian, Spanish and French ownership, mainly in Tangier as *F-OAMS*. In August 1954 it landed at Jersey Airport where it was planned to rebuild it as an executive aircraft for British European Airways Corporation. This fell through and eventually Mr. Owen Hill had it flown in a Bristol Freighter to Eastleigh where in spite of the magnitude of the task it was rebuilt by the Hampshire Aeroplane Club and flew again in March 1959 as a D.H.90A *G-ANYK*. Its performance was considerably improved by Gipsy Major 10 engines driving metal airscrews but it crash landed at La Baule, France on June 22, 1961 while in service with Metropolitan Air Movements Ltd. of Gatwick.

By the 1970s only two Dragonflies remained airworthy. They were A. G. Mechin's *ZS-CTR* at Johannesburg (formerly DETA's *CR-AAB*) and *G-AEDT* "Endeavour" which had been in Australia as *VH-AAD* ever since it was sold to Adastra Airways Ltd. in 1938. In August 1964 it was flown across the Atlantic to join the Tallmantz Collection in California as *N2034*, later moving to a private collection in Idaho before being sold in 1986 to British collector Brian Woodford and shipped home for rebuild. *ZS-CTR* returned to Britain in 1979, where it flew with the period marks *G-AEDU*, originally reserved for Dragonfly *G-ADXM*, until sold in the U.S.A. as *N190DH* in 1983.

SPECIFICATION AND DATA

Manufacturers: The de Havilland Aircraft Co. Ltd., Hatfield Aerodrome, Herts.

Power Plants: Two 130 h.p. de Havilland Gipsy Major 1
Two 142 h.p. de Havilland Gipsy Major 1C*
Two 142 h.p. de Havilland Gipsy Major 1D*
Two 145 h.p. de Havilland Gipsy Major 10

* Identical except for fuel pumps and ignition harness.

Dimensions: Span 43 ft. 0 in. Length 31 ft. 8 in.
Height 9 ft. 2 in. Wing area 256 sq. ft.

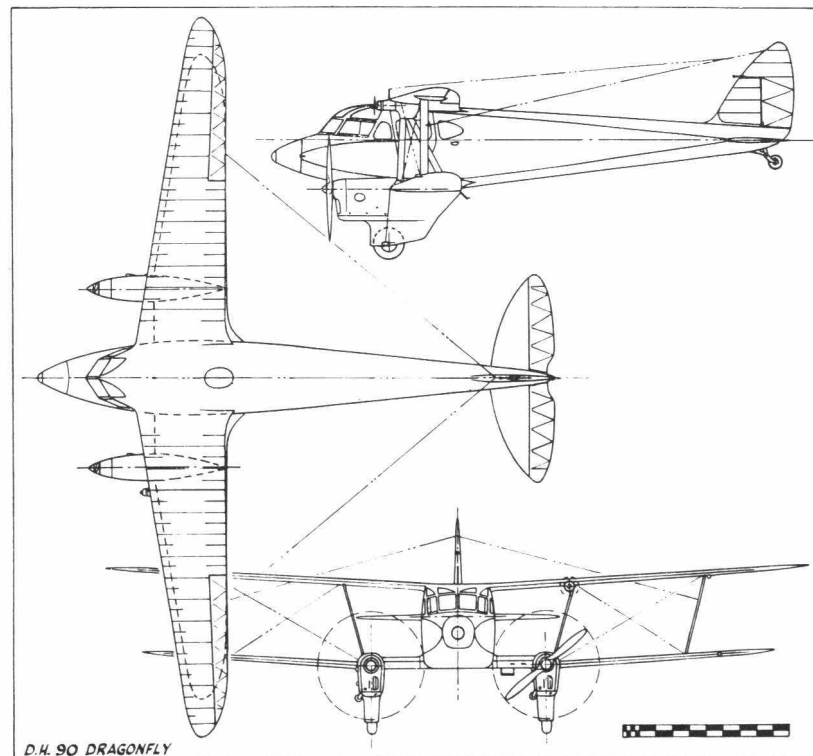
Weights: (Landplane) Tare weight 2,487 lb. All-up weight 4,000 lb.

(Seaplane) Tare weight 3,050 lb. All-up weight 4,300 lb.

Performance: (Landplane) Maximum speed 144 m.p.h. Cruising speed 125 m.p.h.
Initial climb 730 ft./min. Ceiling 18,100 ft.
Range 900 miles
(Seaplane) Maximum speed 130 m.p.h. Cruising speed 110 m.p.h.
Initial climb 600 ft./min.

Production:

Constructor's Numbers	Aircraft markings
7500-7525	<i>G-ADNA</i> , <i>G-AEBU</i> , <i>YI-HMK</i> , <i>G-AEDW</i> , 'CW', 'CX', <i>CF-AYF</i> , <i>G-AEFN</i> , 'DT', <i>G-ADXM</i> , <i>G-AEDH</i> , 'DI', <i>VP-YAX</i> , <i>VH-UXB</i> , <i>G-AEHC</i> , 'DJ', 'DG', 'DK', 'EK', <i>F-AOZC</i> , <i>VP-YBB</i> , <i>F-AOYK</i> , <i>CF-BBD</i> , <i>ZS-AHV</i> , <i>G-AEDV</i> , <i>YI-OSD</i>
7526-7550	<i>CR-AAB</i> , <i>VT-AHW</i> , <i>VP-KCA</i> , <i>F-APDE</i> , <i>CF-MPA</i> , 'PB', <i>CX-AAR</i> , <i>VH-UXA</i> , <i>CX-AAS</i> , South Africa, <i>F-APAX</i> , Shell Mex (Argentina), <i>CF-MPD</i> , <i>PH-KOK</i> , <i>VT-AHY</i> , <i>I-DRAG</i> , <i>F-APFK</i> , <i>CF-BFF</i> , <i>G-AESW</i> , <i>VT-AIE</i> , <i>VH-UXS</i> , <i>YR-FLY</i> , 'FLO', 'FLU', Swedish 3-6
7551-7566	Danish Air Force <i>S.23-S.24</i> , <i>SU-ABW</i> , <i>G-AEXI</i> , 'WZ', <i>G-AFAN</i> , R.C.A.F. 7624, 7625, <i>G-AEXN</i> , <i>ZK-AFB</i> , <i>OO-JFN</i> , <i>VH-UTJ</i> , Shell Mex (Argentina), <i>ZS-ANM</i> , <i>VR-NAA</i> , <i>ZK-AGP</i>



D.H. 90 DRAGONFLY



G-AFDI "Frobisher", c/n 6802, flagship of the Imperial Airways fleet of Albatross passenger aircraft.

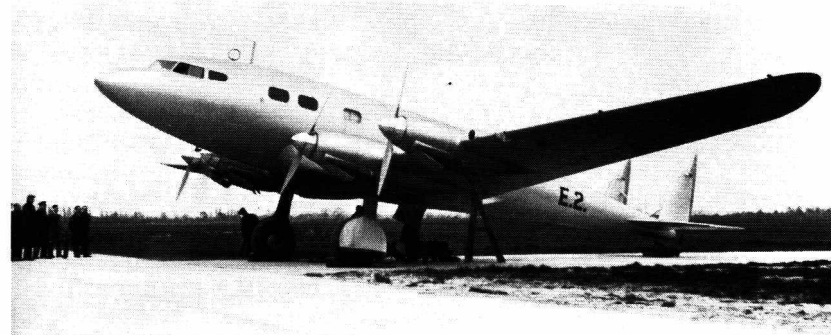
De Havilland D.H.91 Albatross

Although the two seat Comet racer had won the 1934 MacRobertson Race to Australia, its performance was only marginally better than that of the Douglas DC-2 airliner with which it competed. Realising that British airline operators would soon be unable to compete with foreign users of this type of American equipment, the de Havilland company sought financial assistance from the Air Ministry for the construction of a 200 m.p.h. four engined passenger monoplane. After considerable delay and discussion, an order was placed on January 21, 1936 for two experimental Transatlantic mailplanes to Specification 36/35. They were to be equipped with extra fuselage tanks to permit the carriage of 1,000 lb. of payload for 2,500 miles against a 40 m.p.h. headwind at 210 m.p.h.

The first aircraft was scheduled to fly in the autumn of that year but diversion of skilled labour to the Don contract delayed completion until the following spring. Chief test pilot R. G. Waight took the prototype *E-2/G-AEUV* into the air for the first time at Hatfield on May 20, 1937 and it was at once clear that the type name Albatross was well chosen and very appropriate to this most beautiful of all aeroplanes. Designed by A. E. Hagg, it embodied lessons learned with the D.H.71, 77 and 88, achieving economy of operation through speed obtained by clean entry and aerodynamic refinement. The long, tapering circular section fuselage was of wooden stressed skin construction and consisted of laminations of cedar ply with a thick layer of balsa wood between. The layers were cemented under pressure on a retractable jig which enabled the whole fuselage shell to be lifted off in one piece. The 105 ft. one piece cantilever

wing was built, as in the Comet, around a stress-bearing box spar with a thick planking of spruce applied diagonally in two layers. Wheel wells were constructed ahead of the main spar to house the large inward retracting undercarriage, the mechanism for which was driven by a 5 h.p. electric motor.

The 525 h.p. Gipsy Twelve engines were specially designed for the Albatross by Maj. F. B. Halford who united two Gipsy Six engines on a common crankcase to form a 12 cylinder inverted V type unit. It was of low frontal area and further reductions in drag were achieved by fitting large spinners on the two bladed de Havilland controllable pitch airscrews and employing reverse flow cooling, air being led to the backs of the engines from intakes in the leading edge of the wing. The cantilever tail unit was fitted with twin, strutted fins carrying horn balanced rudders and the aircraft was statically exhibited in this configuration in the New Types Park at the Hendon R.A.F. Display of June 26, 1937. Early flight trials, flown by Geoffrey de Havilland Jnr. after R. G. Waight was killed in the T.K.4 on October 1, 1937, proved this arrangement unsatisfactory and the tailplane was redesigned with end mounted fins carrying unbalanced rudders with trim tabs. Teething troubles were also experienced with undercarriage retraction, resulting in a belly landing at Hatfield on March 31, 1938.



The prototype D.H.91 Albatross mailplane E-2/G-AEUV, c/n 6800, in its initial form with tall inset fins and rudders.

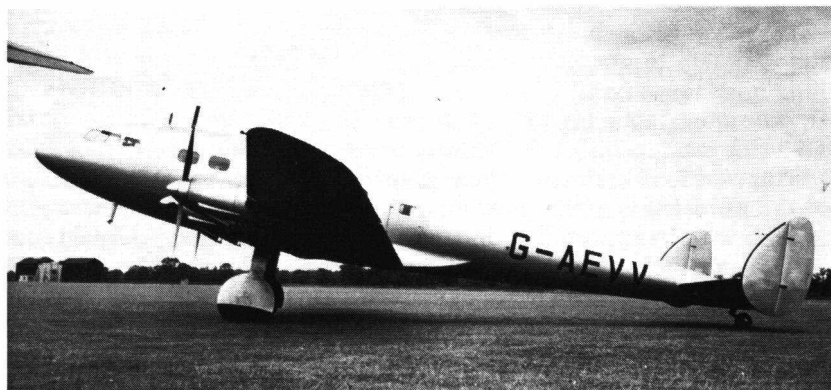
During overload take-off tests with the second prototype *E-3/G-AEUV* on August 27, 1938 the rear fuselage broke in two during the final stages of the third landing run. The aircraft reappeared within a few weeks as *E-5* with reinforcement modifications said to have weighed but 12½ lb. and these were embodied in five production aircraft which had been ordered for Imperial Airways Ltd. Apart from the extra tankage there were several minor differences between the mail and passenger versions, the latter having additional windows and slotted instead of split flaps. "Frobisher", delivered to Croydon in October 1938, became flagship of a new Imperial Airways 'F' class which carried 22 passengers

and four crew. They were first used on an experimental Christmas mail service to Cairo in December of that year and achieved an eastbound average speed of 219 m.p.h. Fast competitive schedules were then instituted on the Croydon-Paris, Brussels and Zürich routes on January 2, 1939 and a week later on January 10th, "Falcon" shattered the first of the inter-city records by landing at Brussels 48 minutes after leaving Croydon.

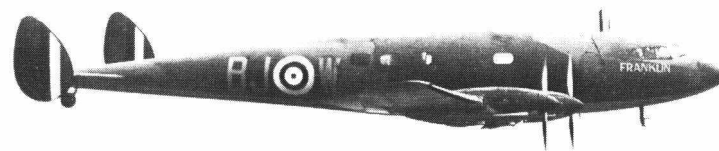
Imperial Airways crews then made experimental flights with the two long range mailplanes, which were added to the 'F' class as "Faraday" and "Franklin" for the purpose. "Fortuna" left for Karachi on August 30, 1939



The fourth 'F' Class Albatross "Fingal" disembarking passengers at Croydon in 1939 with D.H.86B G-ADUF taxiing out behind. (B.O.A.C. Photo.)



The first long range mail carrier in its final form with end-plate fins and rudders.



The second long range Albatross, AX904/G-AEVW "Franklin" in wartime colours as No. 271 Squadron BJ-W. (Real Photographs.)

carrying 11 senior Army officers, returning after a rapid turn round to find war declared and the Albatross fleet evacuated to Bramcote. Almost immediately their base was switched to Whitchurch, Bristol, where they were hurriedly camouflaged for use on the Lisbon and Shannon shuttle services. A year later some of them flew on an emergency courier service for Government documents and officials to Egypt and India, opened when Capt. A. C. P. Johnson left Shoreham in "Fortuna" on September 22, 1940. The two long range aircraft were impressed in September 1940 for service with No. 271 (Transport) Squadron on the Iceland shuttle, but in the confusion of the period, serial numbers issued by the Air Ministry during the design stage were overlooked and new ones allocated. Both retained their 'F' class names and both were destroyed in crashes at Reykjavik. The passenger fleet also lost "Fingal" which forced landed at Pucklechurch, Glos. with a fractured fuel line and collided with a farmhouse in October 1940. For several years thereafter its remains were stacked up on the flat roof-top of C. J. Packer's garage at Burton, Wilts. The flagship was destroyed in a German air raid on Whitchurch at the end of that year, after which the three survivors maintained the various shuttles until "Fortuna", Capt. G. P. Moss, crashed on the mud flats near Shannon in July 1943. With spares non-existent "Fiona" and "Falcon" were broken up a few months later.

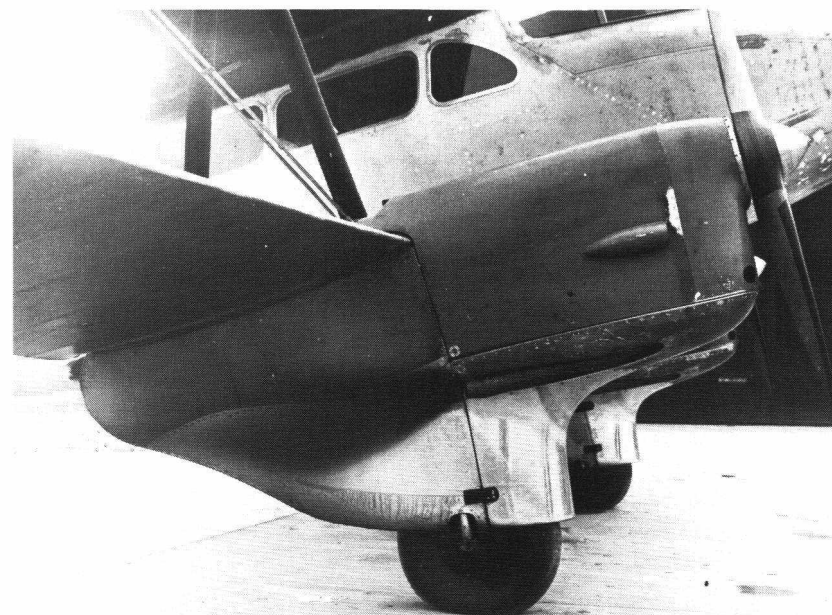
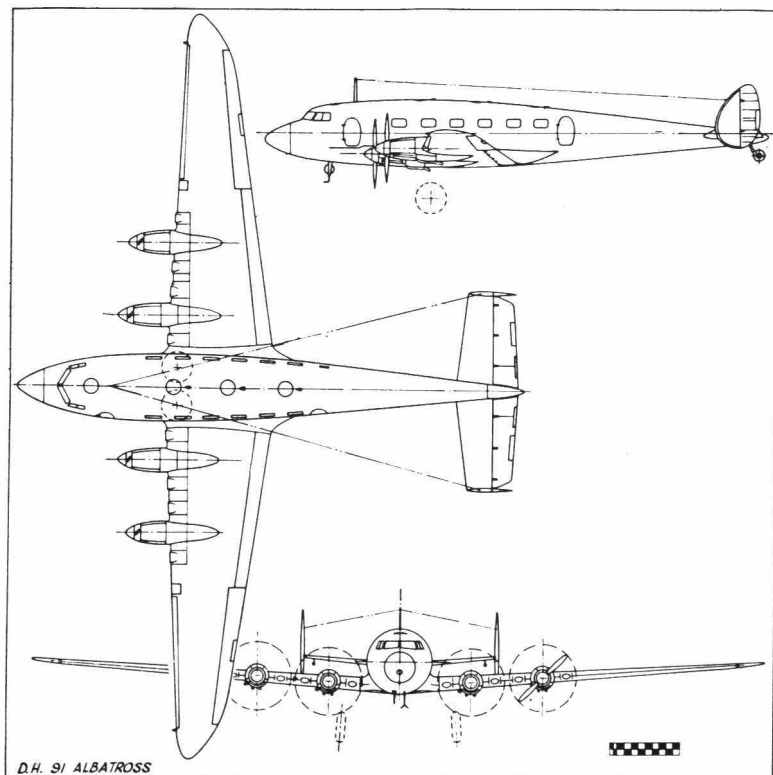
SPECIFICATION AND DATA

<i>Manufacturers:</i>	The de Havilland Aircraft Co. Ltd., Hatfield Aerodrome, Herts.		
<i>Power Plants:</i>	Four 525 h.p. de Havilland Gipsy Twelve series I		
<i>Dimensions:</i>	Span 104 ft. 8 in.	Length 70 ft. 0 in.	
	Height 20 ft. 2 in.	Wing area 1,078 sq. ft.	
<i>Weights:</i>	(Mail)	Tare weight 20,314 lb.	All-up weight 28,500 lb. (overload) 32,900 lb.
	(Passenger)	Tare weight 20,298 lb.	All-up weight 29,500 lb.

Performance: (Mail) Maximum speed 213 m.p.h. Cruising speed 205 m.p.h.
Initial climb 620 ft./min. Ceiling 16,800 ft.
Range 3,230 miles
(Passenger) Maximum speed 225 m.p.h. Cruising speed 210 m.p.h.
Initial climb 700 ft./min. Ceiling 17,900 ft.
Range 1,040 miles

Production:

	Constructor's No. and Registration	C. of A. Issued	Remarks
6800	G-AEVR	29. 9.38	"Faraday"; ordered to A.M. Contract 458574/35 as K8618; to No. 271 Squadron 2.41 as AX903 BJ:W, crashed at Reykjavik 11.8.41
6801	G-AEVR	3. 7.40	"Franklin"; ordered to same Contract as K8619; to No. 271 Squadron 10.40 as AX904, crashed at Reykjavik 7.4.42
6802	G-AFDI	17.10.38	"Frobisher"; destroyed by enemy action at Whitchurch 20.12.40; first flown as E-2
6803	G-AFDJ	1.11.38	"Falcon"; scrapped 9.43
6804	G-AFDK	6. 1.39	"Fortuna"; crashed near Shannon 6.7.43
6805	G-AFDL	4. 4.39	"Fingal"; crashed at Pucklechurch 6.10.40
6806	G-AFDM	16. 6.39	"Fiona"; scrapped 9.43



The D.H.92 Dolphin, E-3, in original form with trousersed undercarriage.

De Havilland D.H.92 Dolphin

The Dolphin was built in the experimental shop at Hatfield in the spring of 1936 to incorporate the firm's many ideas for modernising the D.H.89A Rapide. The nose was redesigned in the style of the D.H.86A with flight deck for two pilots side-by-side with dual control and featured the hinged nose cone of the D.H.90 Dragonfly to give access to a forward baggage compartment. A door in the port side, with retractable step, led into a Rapide-style cabin with rear toilet while a third door, in the starboard side, opened into the main luggage compartment in the rear fuselage.

The mainplanes were of unequal span as on the Dragonfly, with ailerons on the upper wing only, but were rigged with greater sweep-back in the manner of the D.H.86. The strengthened bottom centre section of the Dragonfly was made even thicker and stronger to house a 40 gallon internal fuel tank in each side and, after the trial installation of a faired and unfaired fixed undercarriage, carried one of new design which retracted electrically into enlarged nacelles similar to those of the D.H.88 Comet racer.

The Dolphin's wing cellule used the Dragonfly's bracing system with I struts outboard and inverted Vees inboard, while for ease of loading, all



The Dolphin in final configuration with retractable undercarriage.

bracing wires were eliminated from the inner wing bays. A two-piece trailing edge flap passed right under the fuselage between the nacelles, the tail unit being similar to that of the Rapide but larger, all movable surfaces being mass balanced.

Despite its external similarity to three previous de Havilland types, the majority of the Dolphin's main assemblies were of entirely new design. Power was provided by two 204 h.p. de Havilland Gipsy Six series II engines intended for variable pitch airscrews but for test purposes the prototype was completed and flown with fixed pitch wooden propellers.

Although the civil registration *G-AEMX* was allotted on August 27, 1936—hopefully for the aircraft to participate in the Schlesinger Race from Portsmouth to Johannesburg in the following month, they were not used, Geoffrey de Havilland Jnr.'s flying log books record that he flew it twice only, first on September 9, 1936 and again on November 21. It was found to be structurally overweight and no more examples were built, the prototype's short life being spent in undercoat with the Class B marking *E-3*.

At a time when the works was fully occupied with the development of the D.H.91 airliner and with large-scale production of Tiger Moths for the R.A.F., design staff was not available for solving the Dolphin's weight

problem and the prototype was scrapped.

No three view drawings have been located but sufficient component drawings survive to form the basis of the accurate reconstruction made by Mr. V. W. Clarkson in 1975 and shown on this page. These reveal that the span was 50 ft. 6 in. whereas a contemporary press release quoted 53 ft. 7 in.

SPECIFICATION AND DATA

Manufacturers: The de Havilland Aircraft Co. Ltd., Hatfield Aerodrome, Herts.

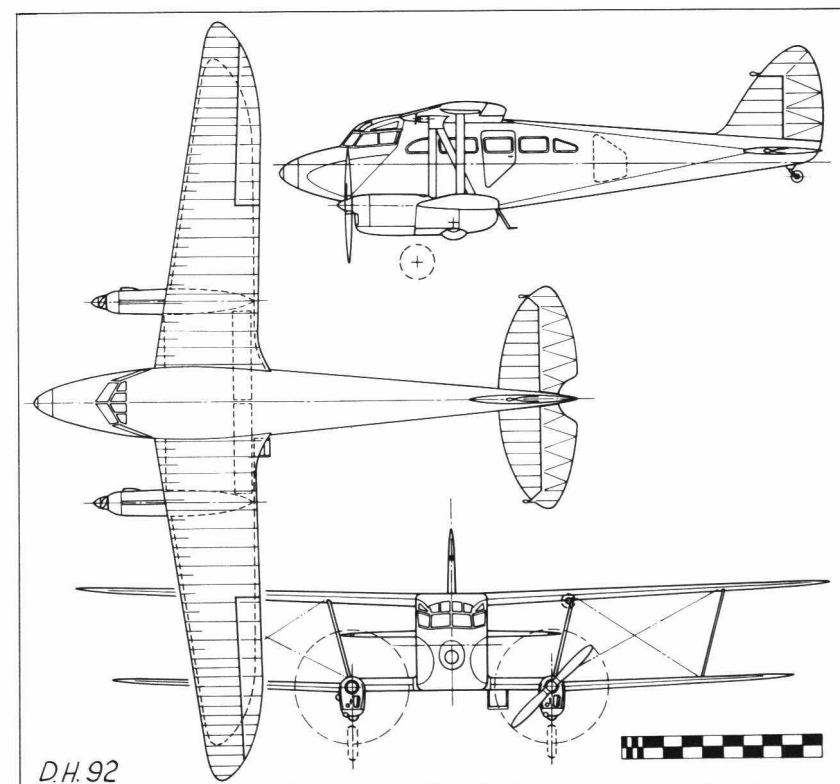
Power Plants: Two 204 h.p. de Havilland Gipsy Six series II

Dimensions: Span (upper) 50 ft. 6 in. (lower) 45 ft. 0 in.
Length 36 ft. 0 in. Wing area 393 sq. ft.

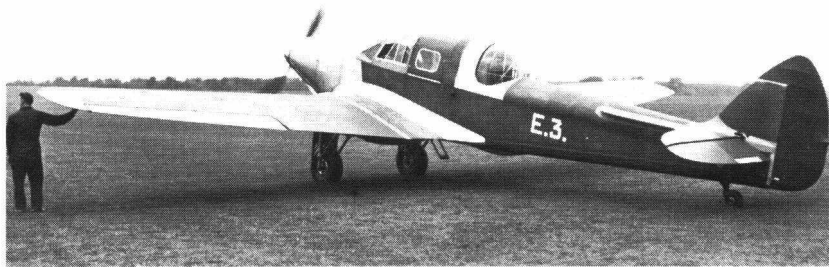
Weight: All-up weight 6,600 lb.

Performance: Estimated maximum speed 161 m.p.h.

Production: Prototype only, c/n 6400, registered 27.8.36 as *G-AEMX*, first flown 9.9.36 as *E-3*, scrapped at Hatfield 12.36.



D.H.92



The prototype D.H.93 Don, turretted general purpose trainer, c/n 9300.
(*'Flight' Photo 14502s.*)

De Havilland D.H.93 Don

The Don was a three seat, low-wing, general purpose trainer with retractable undercarriage built to Specification T.6/36. It was of wooden stressed skin construction with side by side dual controls for pilot instruction, generous cabin space for radio training and a rotatable dorsal turret for gunnery practice. Power was supplied by a 12 cylinder de Havilland Gipsy Twelve aircooled supercharged engine driving a constant speed metal airscrew and as in the D.H.91 Albatross this engine, restyled Gipsy King 1 by the Air Ministry, was cooled by air ducted from intakes in the leading edge of the mainplane.

The prototype, *E-3/L2387*, first flew at Hatfield on June 18, 1937 and was flown at the Hendon R.A.F. Display on the 26th of that month by F/Lt. E. R. Symonds and exhibited there at the S.B.A.C. Show during the following week. Initial flight trials dictated the fitment of small auxiliary fins under the tailplane before the prototype was sent to Martlesham. Production then commenced at Hatfield, airframes receiving constructor's numbers in the 9300 block. Before deliveries commenced however official policies changed and the order was cut back from 250 to 50 aircraft.

An early production Don was used by the manufacturers in 1937 to test a two bladed reversible pitch airscrew for holding down speed in a dive. Officially inspired 'improvements' were then made on such a scale that structural weight became excessive and the turret and other heavy equipment was removed to convert the Don for communications duties. The first such conversion was made to *L2389*, the third airframe, and after this had been submitted to Martlesham, communications Dons were issued in small numbers to No. 24 Squadron, Hendon and to Station Flights at Abingdon, Andover, Brize Norton, Eastchurch, Mildenhall, Netheravon, Northolt, South Cerney, Upavon and Wyton.

Total deliveries amounted to 30 aircraft and another 20 were delivered unassembled or as engineless airframes. Their Service lives were short and by 1940 they had been relegated to Schools of Technical Training or to A.T.C. Squadrons as ground instructional airframes.

SPECIFICATION AND DATA

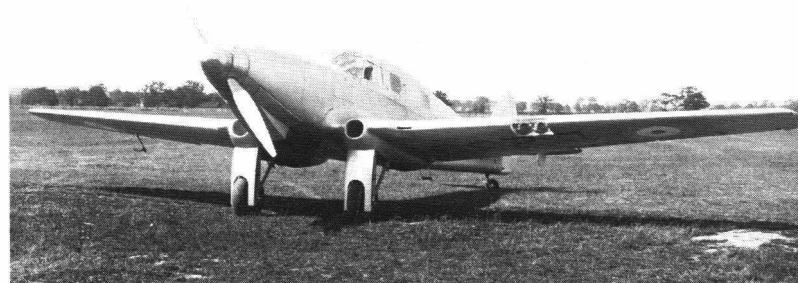
Manufacturers: The de Havilland Aircraft Co. Ltd., Hatfield Aerodrome, Herts.

Power Plant: One 525 h.p. de Havilland Gipsy King 1

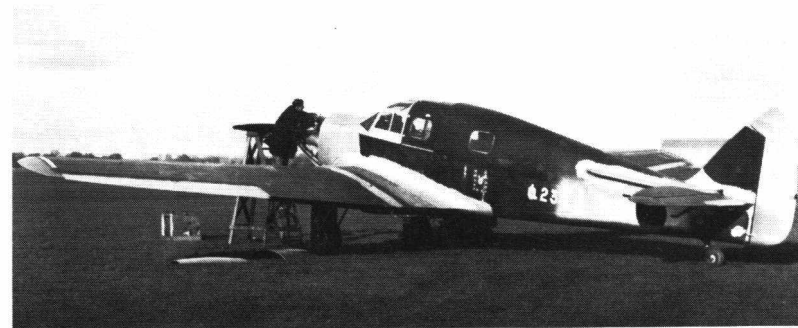
Dimensions: Span 47 ft. 6 in. Length 37 ft. 4 in.
Height 9 ft. 5 in. Wing area 304 sq. ft.

Weights: (Trainer) All-up weight 6,860 lb.
(Communications) Tare weight 5,050 lb. All-up weight 6,530 lb.

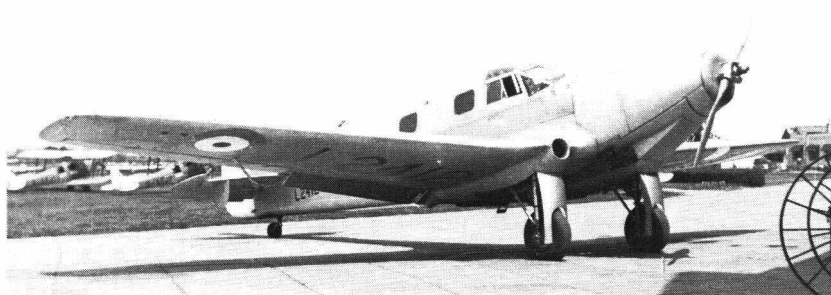
Performance: (Communications) Maximum speed 189 m.p.h. at 8,750 ft.
Initial climb 820 ft./min.
Ceiling 23,300 ft.
Range 890 miles



The fifth D.H.93 Don *L2391*, c/n 9304, converted for communications duties, with auxiliary fins under the tailplane and reduced rudder horn balance area. (*Crown Copyright Reserved.*)



L2389, first Don communications conversion, nearing completion at Hatfield in 1937. (*By courtesy of R. P. Howard.*)



Don L2412 at Hatfield in August 1938 with London Aeroplane Club Tiger Moths G-AFJF and 'JI' in the background. (A. J. Jackson Photo.)

Production:

(a) Completed aircraft

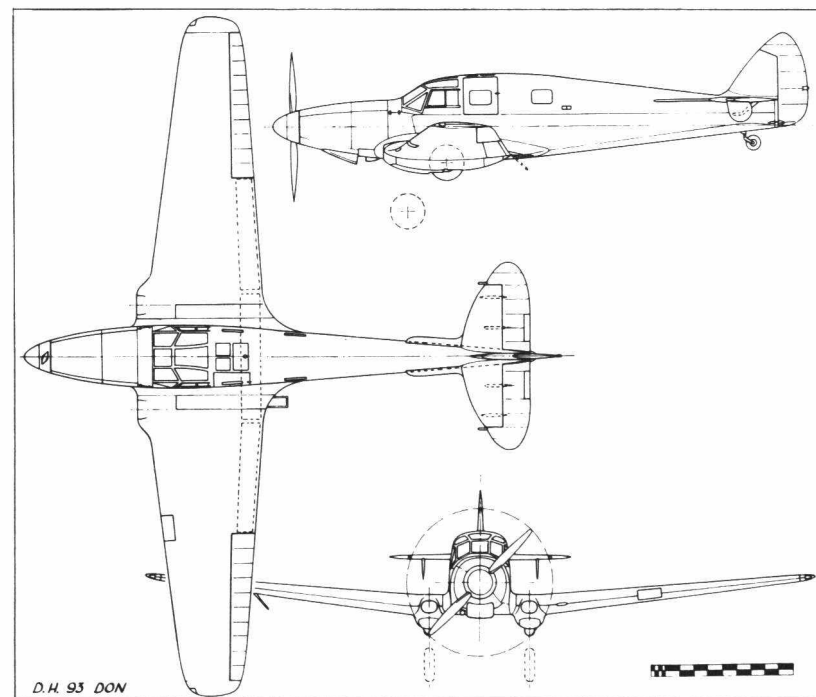
Constructor's No. and Serial	Delivered to
9300 L2387	First flown 18.6.37 as E-3; to No. 1 S. of T.T., Halton; to No. 10 S. of T.T., Kirkham as 1259M in 1941
9301 L2388	First flown 7.12.37; to No. 1 S. of T.T., Halton
9302 L2389	First flown 16.3.38; communications prototype; to No. 1 S. of T.T., Halton; to No. 10 S. of T.T., Kirkham as 1261M in 1941
9303 L2390	First flown 16.8.38; to Central Flying School, Upavon
9304 L2391	First flown 13.6.38; to A. & A.E.E., Martlesham Heath
9305 L2392	Training Command, Eastchurch
9306 L2393	First flown 12.3.38; to No. 11 Group Station Flight, Northolt
9307 L2394	No. 24 (Communications) Squadron, Hendon
9308 L2395	First flown 22.10.38; to No. 1 Group Station Flight, Andover
9309 L2396	No. 2 Group Station Flight, Wyton
9310 L2397	No. 1 S. of T.T., Halton
9311 L2398	No. 3 Group Station Flight, Mildenhall
9312 L2399	No. 1 Group Station Flight, Andover
9313 L2400	First flown 10.12.38; to No. 1 Group Station Flight, Abingdon
9314 L2401	First flown 25.10.38; to No. 1 Group Station Flight, Andover
9315 L2402	First flown 11.1.39; to No. 24 M.U., Ternhill
9316 L2403	First flown 10.12.38; to No. 11 Group Station Flight, Northolt
9317 L2404	No. 24 M.U., Ternhill
9318 L2405	First flown 19.1.39; to No. 1 S. of T.T., Halton
9319 L2406	No. 24 M.U., Ternhill
9320 L2412	First flown 11.7.40 as E-12 and 5.11.40 as E-0232; to instructional airframe as 3356M
9321 L2408	No. 1 S. of T.T., Halton
9322 L2409	Electrical and Wireless School, Cranwell
9323 L2410	First flown 4.2.39; to No. 7 F.T.S., Peterborough; to No. 10 S. of T.T., Kirkham as 1266M in 1941
9324 L2411	First flown 4.2.39; to No. 24 M.U., Ternhill
9325 L2407	Electrical and Wireless School, Cranwell
9326 L2413	Central Flying School, Netheravon
9327 L2414	Station Flight, South Cerney
9328 L2415	Station Flight, Brize Norton
9329 L2416	No. 9 M.U., Hullavington

(b) Unassembled

Constructor's No. and Serial	Delivered to
9330 L2417	No. 1 S. of T.T., Halton
9331 L2418	No. 6 F.T.S., Little Rissington
9332 L2419	No. 5 F.T.S., Sealand

(c) Engineless airframes

Constructor's No. and Serial	Delivered to
9333 L2420	No. 8 F.T.S., Montrose
9334 L2421	No. 11 F.T.S., Shawbury; to No. 10 S. of T.T., Kirkham in 1941
9335 L2422	No. 1 S. of T.T., Halton
9336 L2423	Untraced
9337-40 L2424-27	No. 5 S. of T.T., Locking
9341-43 L2428-30	No. 13 S. of T.T., Gullane
9344-49 L2431-36	No. 2 S. of T.T., Cosford





The D.H.94 Moth Minor South African demonstrator, c/n 94005. ('Flight' Photo 17393.)

De Havilland D.H.94 Moth Minor

As early as 1930 the de Havilland company had considered the introduction of a low wing successor to the Moth which would have no rigging problems, be easier to build, and yet have a superior performance on lower power. First thinking along these lines resulted in the D.H.81 Swallow Moth of 1931, a two seat, open cockpit cantilever monoplane powered by an 80 h.p. Gipsy IV engine. Although a certain amount of development work was done, including the fitting of a cabin top, the type was eventually shelved because in a time of trade depression, full productive capacity had to be concentrated on old favourites such as the Puss Moth, biplane Moths and Dragon derivatives.

Nevertheless Capt. Geoffrey de Havilland personally kept the scheme alive, brought it to fruition five years later as the D.H.94 Moth Minor and made the first flight in the prototype, *E-4*, at Hatfield on June 22, 1937. He then shared the test flying with son Geoffrey and John Cunningham, during which the last mentioned pair parachuted from a Moth Minor, which refused to recover from a spinning during CG aft limits trials. Power was supplied by a 90 h.p. Gipsy Minor engine specially designed for it by Maj. F. B. Halford. The airframe was the product of a design team led by J. H. Phillips and J. P. Smith who married the well proven spruce and plywood box-style fuselage of the original wooden Moth to a high aspect ratio plywood covered mainplane built on similar lines to those of the Comet and Albatross. The wing folded outboard of the centre section, in the root ends of which space was provided for suitcases or extra fuel tanks. Tail surfaces were fabric covered, ailerons and rudder were mass balanced and a spring loading device corrected trim when changing from powered to gliding flight. Cantilever undercarriage legs were anchored to the front spar of the centre section and wheel brakes and a tail wheel were fitted as standard. The aircraft was flown from the front seat and provided with a

large perforated air brake under the centre section to steepen the glide and shorten the landing run.

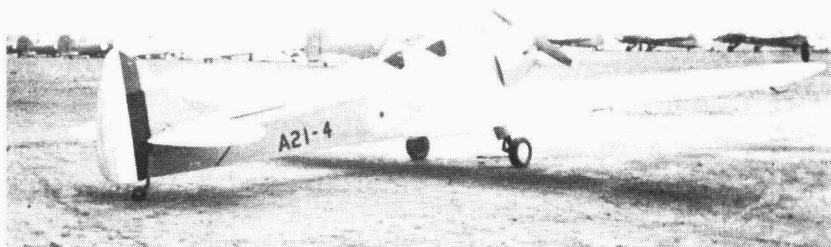
By June 1939 production in the Hatfield '94 shop' had already reached eight aeroplanes a week, mainly in a constructor's number series commencing 94001 but including nine special aircraft commencing 9400. They were priced at £575 ex works and to initiate the sales drive one Moth Minor was despatched to each of the Australian, Canadian, Indian and South African companies while British flying clubs, eager for modern equipment and cheaper flying, ordered a considerable number. In the last pre-war summer deliveries were made to the Airwork, Bristol and Wessex, Cambridge, Doncaster, Edinburgh, Grimsby, Hull, Hartlepool and Teesside, Herts and Essex, Kent, Lancashire, London, Newcastle, Norfolk and Norwich, R.A.F. and Redhill Flying Clubs where they were fully employed on subsidised Civil Air Guard training. A few were acquired by private owners including Lord Londonderry with *G-AFNE*, and following the Paris and Brussels Aero Shows of 1938-39, by owners in Switzerland, Holland, Portugal, Egypt, Singapore and New Zealand. *G-AFPB* was used exclusively by the British Aviation Insurance Group.



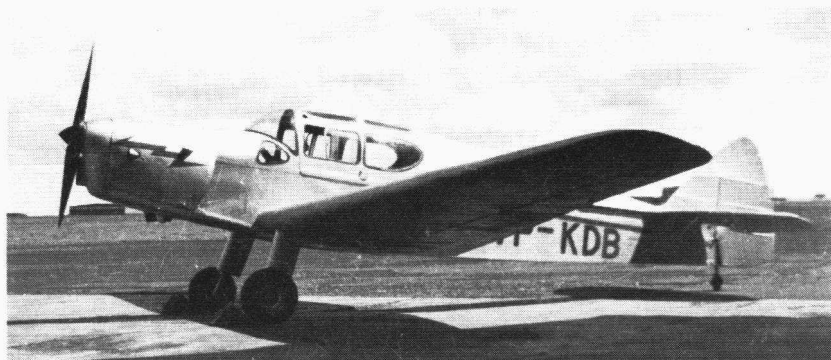
The second Hatfield-built Moth Minor *VH-AAM* was withdrawn from use in 1958 after 19 years service in Australia.



The sole Canadian Moth Minor at Hamilton in 1939. It became an instructional airframe at the Central Technical College, Toronto in 1943. (K. M. Molson Photo.)



Royal Australian Air Force Moth Minor A21-4 at Cootamundra in 1941. (By courtesy of John Hopton.)



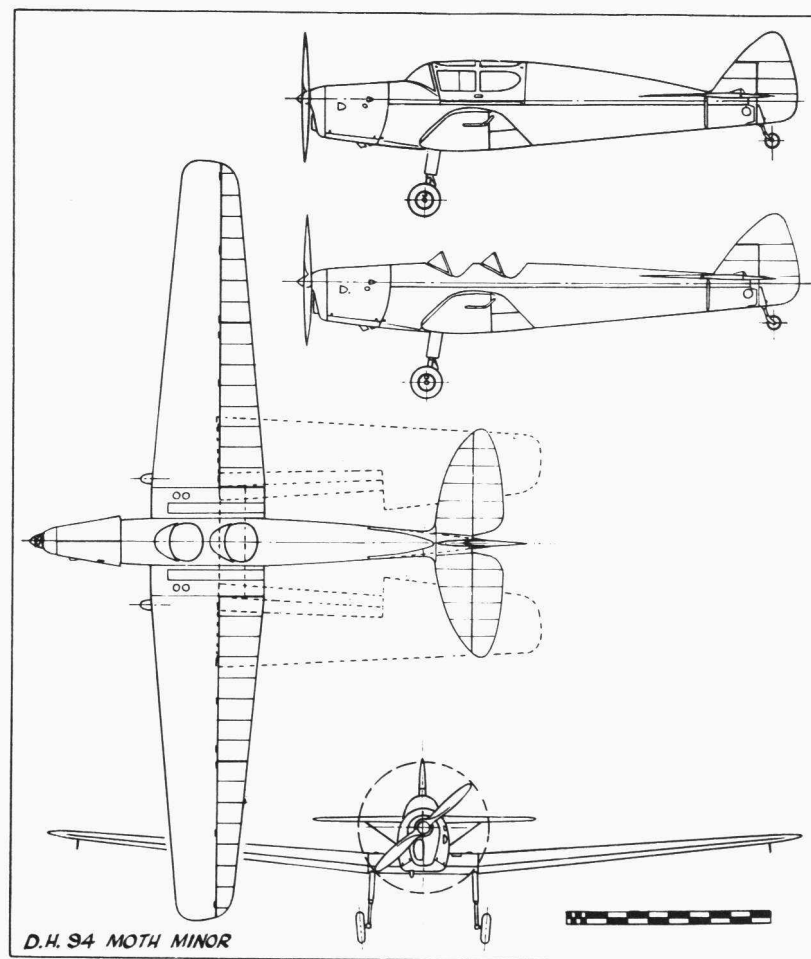
Campling Bros.' Moth Minor VP-KDB at Nairobi in 1946 with nationality stripes over the registration.

Over 100 Moth Minors had been built by September 1939 but early in 1940 production was abandoned because all the Hatfield factory space was required for the war effort. All the Moth Minor drawings, jigs and tools, along with stocks of finished and unfinished airframes were then shipped to Australia where construction was completed in the Bankstown factory of de Havilland Aircraft Pty. Ltd. At least 40 were supplied to the Royal Australian Air Force as an interim trainer until the Tiger Moth was available in quantity. A considerable number survived the war and served Australian light aviation faithfully for many years. Thirty-two Moth Minors impressed by the British Air Ministry were used for a wide variety of purposes but many were issued to Station Flights and became Commanding Officers' personal mounts. One British civil Moth Minor, G-AFPJ, owned by Lt. R. Kent was at Almaza, Cairo at the outbreak of war and was almost certainly that procured by the U.S.A.A.F. and flown in the Near East during the war as 42-94128 "Sand Fly".

The nine Moth Minors in the 9400 series included several with hinged coupé tops, the first of which flew in the summer of 1938. Three others were despatched to de Havilland Aircraft of India Ltd. at Karachi on

September 21, 1940 and one of these, supplied originally to the Maharajah of Jaipur as VT-AMG was still in use in 1961. Another, VT-AMF ex G-AFSD, was sold in January 1941 as VP-CAG to C. A. S. Booth in Ceylon where in July of the following year it was impressed by the Admiralty as NP490 and shipped to Mombasa on a carrier. Its colourful career ended in a funeral pyre on the beach at Rumuruti, Kenya on October 15, 1950 while in service with Campling Bros. as VP-KDB.

One coupé from the main batch was modified by the de Havilland company as a long range machine for an attempt on the light aeroplane long distance record by John Cunningham who hoped to reach Baghdad. This was first flown by G. de Havilland Jnr. as E-2 on March 31, 1939 and by his brother John on April 8, 1940 by which time war had stopped the attempt. It was first of an experimental trio, the next, fitted with a tricycle



undercarriage and canopy over the rear seat, being flown by John de Havilland as *E-6* on April 29, 1940. The last was a cabin model, *E-14/G-AGAO*, with hand operated variable pitch airscrew. The firm also supplemented its two communications Hornet Moths with the camouflaged open cockpit Moth Minor *G-AFTH* which had been assessed for basic trainer suitability at Boscombe Down in December 1939, and with the coupé *OJ*. From 1942 the latter flew as *E-0236* (later *E-1*) and after the war was acquired by the London Aeroplane Club. Piloted by Pat Fillingham it averaged 137.5 m.p.h. in the South Coast and *Daily Express* Air Races in 1950. Sixteen others came up for disposal after the war, most of which were used privately with great success, and several were raced as single seaters with the front or rear cockpit faired in according to taste. Seven which survived in the United Kingdom included *G-AFNG* and *NI*, originally open models but converted into the standard cabin type at Panshanger in 1954. *ZK-ALD* was similarly modified in New Zealand and *F-PFYR*, owned in 1939 by the Hartlepool and Teesside Club as *G-AFNF*,



The tricycle Moth Minor *E-0226*, c/n 94102. (de Havilland Photo.)



The D.H.94 Moth Minor Coupé *E-14*, c/n 94103, in wartime camouflage with variable pitch airscrew. ('Flight' Photo 17801.)



Moth Minor *F-PFYR*, c/n 94010, with coupé top of French manufacture.

later had a cabin top of French design similar to the sliding hood on Canadian-built Tiger Moths. In 1960 it was the property of Mons. R. Argot and was based at Calais/Marcke. At that time ten former R.A.A.F. Moth Minors were still active in private hands in Australia, four demobilised by the R.N.Z.A.F. survived in New Zealand and two secondhand machines were flying in Singapore and Java respectively.

G-AFOZ, which had been kept in immaculate condition as part of Sir William Robert's Collection at Strathallan, crashed during a display at Turnhouse on May 3, 1975. It was outlived by R. Parker's *G-AFOB* at Denham, R. W. Livett's coupé model *G-AFNG* at Sywell, and Redhill based *G-AFPN* which were all airworthy in 1987. Three other British D.H.94s were also extant in that year, *G-AFOJ* and *G-AFNI* in store and *G-AFPR* on long term rebuild at Hamble. In the U.S.A., the Australian built example, *N94DH*, remained airworthy at Harlingen, Texas, as part of the Confederate Air Force.

SPECIFICATION AND DATA

<i>Manufacturers:</i>	The de Havilland Aircraft Co. Ltd., Hatfield Aerodrome, Herts. de Havilland Aircraft Pty. Ltd., Bankstown Aerodrome, Sydney, N.S.W.		
<i>Power Plant:</i>	One 80 h.p. de Havilland Gipsy Minor		
<i>Dimensions:</i>	Span 36 ft. 7 in.	Length 24 ft. 5 in.	
	Height 6 ft. 4 in.	Wing area 162 sq. ft.	
<i>*Weights:</i>	Tare weight 960 lb.	All-up weight 1,550 lb.	
<i>*Performances:</i>	Maximum speed 118 m.p.h.	Cruising speed 100 m.p.h.	
	Initial climb 590 ft./min.	Ceiling 18,400 ft.	
	Range 300 miles		

* Open cockpit model.

Production:

(a) Main series, Hatfield built

Constructor's Numbers	Aircraft markings
94001-94025	<i>G-AFRD, VH-AAM, CF-BFQ, VT-ALI, ZS-ARE, crashed on test, G-AFPC, 'OM, 'PG, 'NF, ZS-ARF, G-AFON, 'PK, 'NG, 'PB, 'PH, VR-SBE, G-AFOB, 'NE, HB-OMU, G-AFOT, 'OD, 'NH, 'OE, CS-ABS</i>
94026-94050	<i>G-AFPT, 'OX, VH-ADA, G-AFMZ, 'PJ, 'PR, 'PM, 'OO, 'PD, 'NI, PH-ATX, VR-SBF, G-AFNJ, 'OU, 'TH, 'OP, 'OC, 'OY, 'PN, 'PU, ZK-AHL, G-AFOW, 'NK, VH-ACO, G-AFNZ</i>
94051-94059	<i>SU-ACE, G-AFPO, 'OV, SU-ACG, G-AFOZ, 'OF, 'PI, 'NA, 'PS</i>
94062, '66, '69	<i>SU-ACI, G-APNB/South Africa, SU-ACJ</i>
94101-94103	<i>E-2 (long range cabin model), E-6/E-0226, E-14/G-AGAO</i>

(b) Completed in Australia

Constructor's Numbers	Aircraft markings
94060 and '61	<i>A21-4/VH-AFT, NZ591/ZK-AKL</i>
94063-94065	<i>G-AFOG, G-AFPW, G-AFPA</i>
94067 and '68	<i>G-AFNN/VH-ACR/A21-42, G-AFRJ</i>
94070-94079	<i>G-AFOS, NZ592, G-AFNX/VH-ACQ, VH-ADC/PK-BFC, G-AFOA, R.A.A.F., VH-AGT, R.A.A.F./VH-AMI, VH-ADB, R.A.A.F., A21-3 R.A.A.F./VT-ALJ, R.A.A.F., G-AFYP, G-AFYR, G-AFUU, R.A.A.F., G-AFYS, R.A.A.F./VH-AHT, R.A.A.F./VH-AFV, G-AFSE</i>
94090-94100	<i>R.A.A.F. (5), G-AFUV/A21-30/VH-AFQ/CF-AOO, R.A.A.F., A21-24, R.A.A.F. (2), G-AFSF</i>
94104-94106	<i>G-AFYT, G-AFZM, G-AFZN</i>

Note: British civil markings in the above list were not used and the aircraft were delivered with Royal Australian Air Force serials.

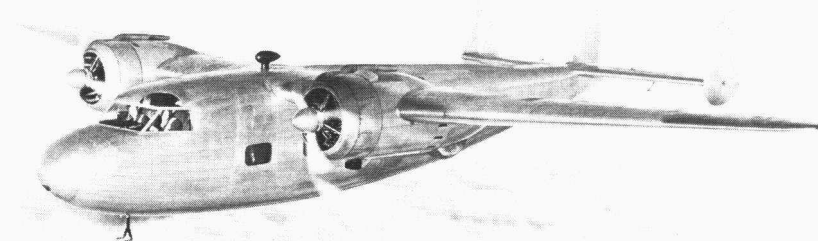
(c) Entirely constructed in Australia

Constructor's Numbers	Aircraft markings
DHP.17-DHP.19	<i>R.A.A.F./VH-AIB, A21-39/VH-AFS, A21-40/VH-AXB/VH-BXB</i>

Note: The above were three of the four Moth Minors built with Australian materials but using metal parts imported from the United Kingdom.

(d) Sub series, Hatfield built

Constructor's Numbers	Aircraft markings
9400-9408	<i>E-6/G-AFSD, 'NY, 'RY, 'RR, 'OR, E-7/G-AGAM, 'AN, E-1/G-AFOJ, 'PL</i>



The prototype D.H.95 Flamingo with the temporary central fin.

De Havilland D.H.95 Flamingo

The first stressed skin, all metal aircraft built by the de Havilland company was designed by R. E. Bishop and named Flamingo by Capt. de Havilland who had seen the bird in its natural habitat when he flew a new Rapide, *VP-KCL*, to Kenya and delivered it to Wilson Airways Ltd. at Nairobi a short time before. The Flamingo was a handsome high-wing cantilever monoplane powered by two 890 h.p. Bristol Perseus XIIC sleeve valve radials and equipped with such up to date refinements as D.H. hydromatic three bladed airscrews, split trailing edge flaps, hydraulically retractable undercarriage and a low slung fuselage affording the ease of entry and loading necessary for short haul work. Passenger accommodation varied between 12 and 17 according to the range while the normal crew comprised Captain, First Officer and radio operator. Prototype trials commenced at Hatfield with the first flight of the unmarked prototype on December 22, 1938 piloted by Geoffrey de Havilland Jnr. and George Gibbins, and included the temporary fitment of a third, central, fin. This was removed when enlarged fins with horn balanced rudders of greater area were fitted.

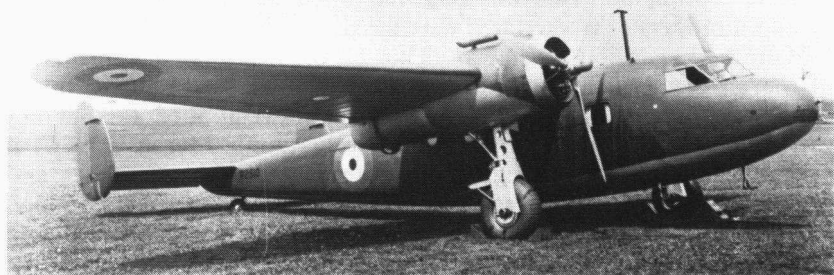
With the Expansion Scheme at its height, the remarkable performance of the all metal Flamingo attracted Air Ministry interest as a future military transport and serial number T5357 was allotted to, but not carried by, the prototype during official evaluation in March 1939. Civil orders were placed by the Egyptian Government and by Guernsey and Jersey Airways Ltd. with whom the prototype went into service on loan in May 1939 for proving flights between Guernsey, Jersey, Eastleigh and Heston. Before the two Flamingoes ordered by this company could be delivered, war had broken out and they joined the prototype as V.I.P. transports with No. 24 (Communication) Squadron at Hendon for the



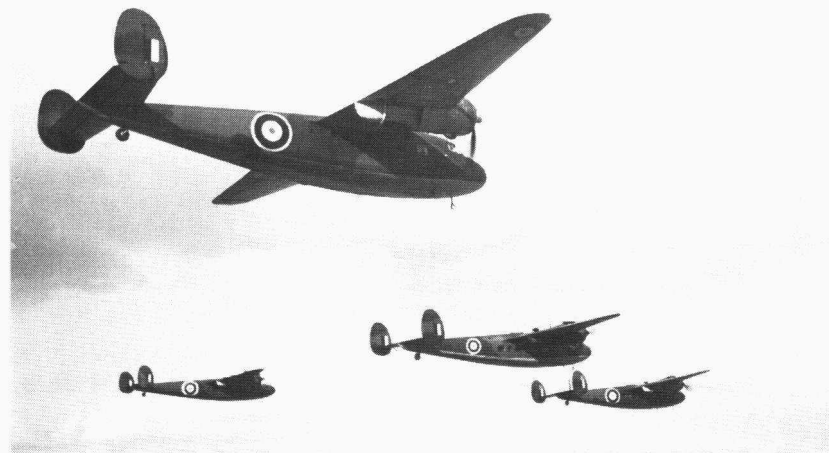
The prototype Flamingo in the colours of Guernsey and Jersey Airways Ltd.

use of Mr. Winston Churchill and his advisers when making urgent trips to France during the pre-Dunkirk period.

Thirteen other Flamingoes were completed, ten to civil standards and three for the R.A.F., the first two of which, *R2764* and '65 to Specification 21/39, were delivered to the King's Flight at Benson on September 7, 1940. The third, *R2766*, furnished for communication duties to Specification 20/39, earlier sent to No. 24 Squadron on May 2nd, was attached to the King's Flight during the invasion scare and allotted temporary civil status as *G-AGCC* for possible emergency use by the Royal Family. After inspection by King George VI at Hatfield on August 15, 1940 it was flown to Benson by George Gibbins on September 7th but returned to No. 24 Squadron on February 14, 1941 as *R2766*. It was named "Lady of Glamis" in 1942 and joined the would-be Jersey Flamingo *G-AGAZ*. This had been used to flight test Bristol Perseus XVI engines with Hamilton hydromatic quick-feathering airscrews under Class B rules as *E-16*. It was delivered to No. 24 Squadron in civil marks on June 8, 1940, became *AE444* in the following September and was named "Lady of Ayr" in 1942. In September



The one-and-only Hertfordshire *R2510*, c/n 95006. The small circular windows are discernible below the starboard engine.



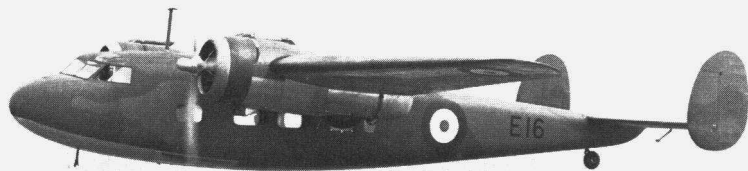
A unique formation on October 1, 1940 by the Hertfordshire *R2510* nearest, the prototype as *T5357* leading with *R2764*, and *AE444* away to port. ('Flight' Photo 17961s.)

1944 both were transferred to the Metropolitan Communications Squadron.

Commencing with the R.A.F. aircraft, one of which, *R2765*, was subjected to acceptance tests at Boscombe Down in April 1940, Flamingoes had increases in wing span from 68 ft. to 70 ft. and in aileron span from 11 ft. 10 in. to 14 ft. 0 in. They also had decreases in dihedral, in flap area and in the size of the rudder horn balance.

A much publicised military version known as the Hertfordshire was ordered to Specification 19/39 and one prototype, *R2510*, was built but differed little from the production Flamingo and was only identifiable by small circular portholes which replaced all but the first large cabin window. No others were built and a contract for 30 production Hertfordshires, *R2511*–*R2529* and *R2550*–*R2560*, was cancelled. They were to have had a revised cabin layout as 22 seat troop carriers.

Seven fully camouflaged civil Flamingoes delivered to British Overseas Airways Corporation at Bramcote between September 1940 and April 1941 were transferred to the Near East as the 'K' Class and bore the names of Kings of England. Powered by 930 h.p. Bristol Perseus XVI engines, they were flown from St. Eval, Cornwall, to Cairo via Gibraltar and Malta with long range tanks. *G-AFYE*, 'YF', 'YI', 'YJ' and 'YK' had two 94 gallon Saro Cloud fuel tanks each and the others spare D.H.95 wing tanks. They were based for several years at Almaza and flew southward to Asmara, Aden and Addis Ababa, and northward to Jedda, Lydda and Adana in Turkey. The eleventh aircraft, intended as *G-AFYH*, first flown on November 29, 1940, was diverted from the B.O.A.C. contract direct to No. 782 (Transport) Squadron, Fleet Air Arm as *BT312* "Merlin VI" (later "Merlin



Flamingo *E-16* test flying with 930 h.p. Perseus XVI engines before becoming *G-AGAZ*. ('Flight' Photo 17798s.)

27"). Based at Donibristle, it operated services to the Orkneys, the Shetlands and Northern Ireland and was joined on March 10, 1945 by *R2766* which had been delivered from Hendon to the D.H. Repair Unit at Witney for conversion to naval standards on November 7, 1944.

The 16th to 19th Flamingo airframes were never completed and among them were two for which registrations *G-AFYZ* and *'ZA* had been reserved by B.O.A.C. The final and frustrated Egyptian Government Flamingo *G-AGBY* replaced the diverted *'YH* and was named "King William". In 1942-43 "King Arthur", "King Henry" and "King Harold" were lost in crashes and soon afterwards shortage of spares forced the remaining five out of service. All but "King William" were shipped home in 1944 and stored at Croydon prior to disposal to British Air Transport Ltd. at Redhill. A proposal that they should be rebuilt by Tiltman Langley Laboratories Ltd. fell through, and the only Flamingo to operate postwar was *'YH* which had been flown from Donibristle to Gatwick via Eglinton and Lee-on-Solent in full naval regalia on August 19, 1945 by Mr. Neil Urquhart. He also test flew it for C. of A. two years later after it had been made airworthy by Southern Aircraft (Gatwick) Ltd. with spares from the repatriated B.O.A.C. aircraft. A few charter flights in B.A.T. silver and black were made after delivery to Redhill in May 1947 but in 1949



G-AFYH in British Air Transport Ltd.'s black and silver livery, 1952.

'YH was pushed into a hangar, and broken up for scrap when Redhill Aerodrome closed down in May 1954.

SPECIFICATION AND DATA

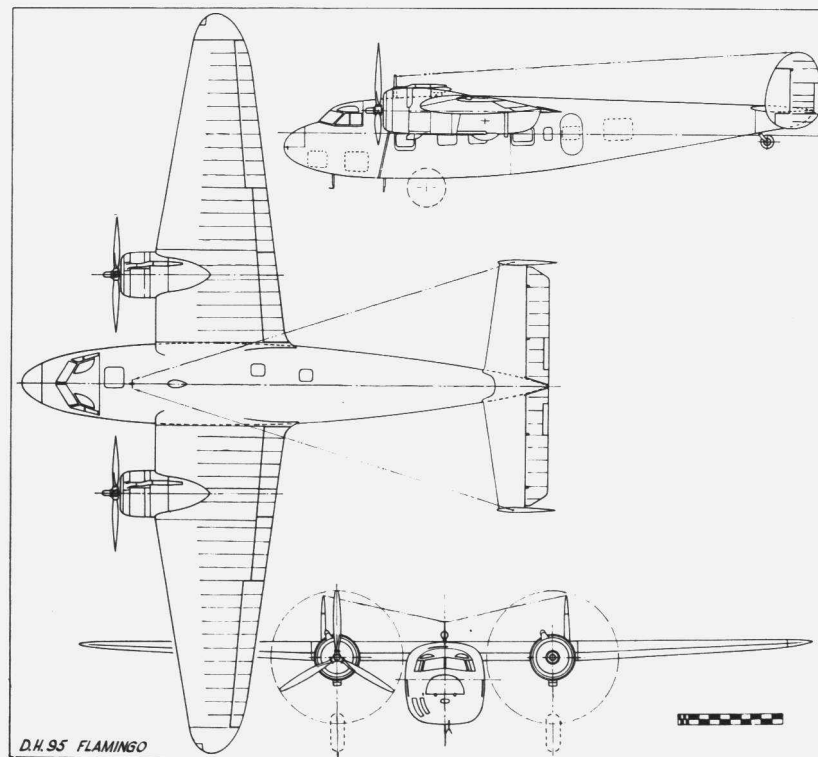
Manufacturers: The de Havilland Aircraft Co. Ltd., Hatfield Aerodrome, Herts.

Power Plants: Two 890 h.p. Bristol Perseus XIIC
Two 930 h.p. Bristol Perseus XVI

Dimensions: Span (Prototypes) 68 ft. 0 in. (Production) 70 ft. 0 in.
Length 51 ft. 7 in. Height 15 ft. 3 in.
Wing area (Prototype) 639 sq. ft. (Production) 651 sq. ft.

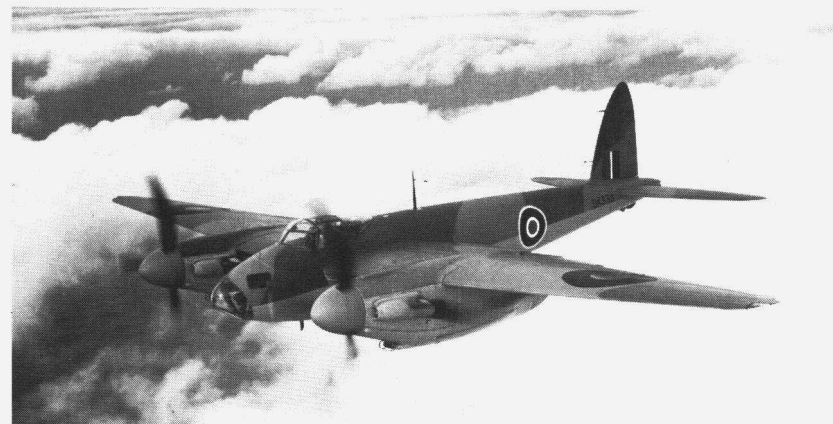
Weights: (Prototype) Tare weight 10,906 lb. All-up weight 16,500 lb.
(Production) Tare weight 11,325 lb.
All-up weight (Perseus XIIC) 17,600 lb.
(Perseus XVI) 18,000 lb.

Performance: (Prototype) Maximum speed 239 m.p.h. Cruising speed 184 m.p.h.
Initial climb 1,100 ft./min. Ceiling 20,150 ft.
Range 1,305 miles
(Production) Maximum speed 243 m.p.h. Cruising speed 204 m.p.h.
Initial climb 1,470 ft./min. Ceiling 20,900 ft.
Range 1,345 miles



Production:

	Constructor's No. and Registration	C. of A. Issued	Remarks
95001	G-AFUE	30. 6.39	To No. 24 Squadron 21.10.39; impressed 2.40 as T5357 under A.M. Contract B.62030/39; struck off charge after flying accident 4.10.40
95002	G-AFUF	12. 1.40	Ordered by Guernsey Airways Ltd.; to No. 24 Squadron 20.1.40; impressed 7.40 as X9317 under A.M. Contract B.8999/39; struck off charge 10.42
95003	R2764	Nil	First flown 23.2.40; to No. 24 Sqn., Hendon; crashed near Great Ouseburn, Yorks. 30.4.42
95004	R2765	Nil	First flown 2.2.40 as E-10; to A. & A.E.E., Boscombe Down 20.3.40; to No. 24 Sqn. 3.5.40, named "Lady of Hendon"; scrapped 1944
95005	E-16	Nil	First flown 7.4.40 as Perseus XVI testbed; to No. 24 Sqn. 8.6.40 as G-AGAZ; C. of A. 17.7.40; impressed 9.40 as AE444; named "Lady of Ayr" 1942; scrapped at Hendon 1944
95006	R2510	Nil	Hertfordshire prototype to Contract B.8997/39; to No. 24 Sqn. 6.6.40; crashed at Mill Hill, London 23.10.40
95007	G-AFYE	10. 9.40	B.O.A.C. "King Arthur"; first flown 20.7.40; crashed at Asmara, Eritrea 15.2.43
95008	R2766	28. 6.40	To King's Flight, Benson 12.7.40 as G-AGCC; to No. 24 Sqn. 14.2.41 as R2766, named "Lady of Glamis" in 1942; to R.N.A.S. Donibristle 10.3.45 and reduced to spares
95009	G-AFYF	11.10.40	B.O.A.C. "King Alfred"; first flown 28.9.40; scrapped at Redhill in 1950
95010	G-AFYG	19.10.40	B.O.A.C. "King Harold"; first flown 11.10.40; crashed at Addis Ababa, Ethiopia 18.11.42
95011	G-AFYH	Nil	First flown 29.4.40; impressed by the Admiralty 5.40 as BT312 "Merlin VI" (later "Merlin 27"); restored 10.46, C. of A. 7.6.47 for British Air Transport Ltd.; scrapped at Redhill 5.54
95012	G-AFYI	19.12.40	"King Henry", crashed at Adana, Turkey 13.9.42
95013	G-AFYJ	10. 1.41	"King Richard", scrapped at Redhill 1950
95014	G-AFYK	21. 3.41	"King James", first flown as E-17, scrapped at Redhill 1950
95015	G-AFYL	21. 4.41	"King Charles", scrapped at Redhill 1950
95016-19	R2511-14	Nil	Unfinished Hertfordshire airframes
95020	BK822	Nil	Built for Egypt; to B.O.A.C. 8.2.41 as G-AGBY; C. of A. 19.4.41; delivered St. Eval-Cairo 9.41 as "King William"; shipped back 1945 and scrapped at Witney



D.H.98 Mosquito B. Mk. IV DK338. (De Havilland Photo.)

De Havilland D.H.98 Mosquito

Experience in the design and construction of wooden aircraft of exceptional performance convinced the de Havilland company that it was possible to build an unarmed bomber which could outfly all contemporary fighters. First ideas in 1938 envisaged a miniature Albatross powered by two Rolls-Royce Merlin engines and having sufficient range to carry a worthwhile bomb load to Berlin, but in October of that year the project was turned down by the Air Ministry, at that time incapable of seeing any virtue in unarmed wooden aeroplanes. Nothing was done until December 29, 1939 when, through the foresight and enthusiasm of Sir Wilfred Freeman, Air Council Member for Research, Development and Production, detailed design was sanctioned for a light bomber having a range of 1,500 miles and able to carry a bomb load of 1,000 lb. It was to be equally suitable for unarmed reconnaissance or as a long range fighter.

Design work was done at Salisbury Hall, London Colney, by a team headed by R. E. Bishop and on March 1, 1940, after considerable official reluctance, a contract for 50 aircraft W4050-W4099 was placed to Specification B.1/40. Designated D.H.98 Mosquito, it was an all wood cantilever monoplane with a slim, circular section, tapering fuselage built of laminations of cedar ply separated by a layer of balsa wood. To simplify the installation of controls, wiring and pipelines, port and starboard halves of the fuselage were made separately, and the one piece, stressed skin mainplane was built round the radiators and ten fuel tanks of 539 gallons total capacity. The low drag nacelles for the 1,250 h.p. Merlin 21 motors housed the retractable undercarriage for which the D.H. system of rubber-in-compression shock absorbers was revived to speed production, to which end light alloy castings were used instead of forgings.



The prototype Mosquito E-0234, c/n 98001, at Hatfield in November 1940 with impressed Tiger Moth G-ADIB in background.

The Mosquito prototype was built secretly in a small hangar at Salisbury Hall and flew for the first time in the hands of Geoffrey de Havilland Jnr. at Hatfield on November 25, 1940, less than 11 months from the start of design work. Performance during the first two flight tests, made in B conditions as E-0234, astounded even the manufacturers and its fighter-like manoeuvrability and upward rolls from ground level on one engine at last attracted active official interest. The prototype was re-serialised W4050 for further flight tests and for three months of official trials which began on February 19, 1941 and established it as the world's fastest operational aircraft, a distinction it enjoyed for the next 2½ years.

To save a month of dismantling and re-erection time, W4052, the Mosquito II night fighter prototype to Specification F.21/40, was flown out of a field at Salisbury Hall by the same pilot on May 15, 1941. It had strengthened wing spars so that it could be thrown about in combat and was equipped with four 20 mm. Hispano cannon under the floor, four machine guns in the nose, a flat bullet-proof windscreen and the then



D.H.98 Mosquito N.F. Mk. II W4076.

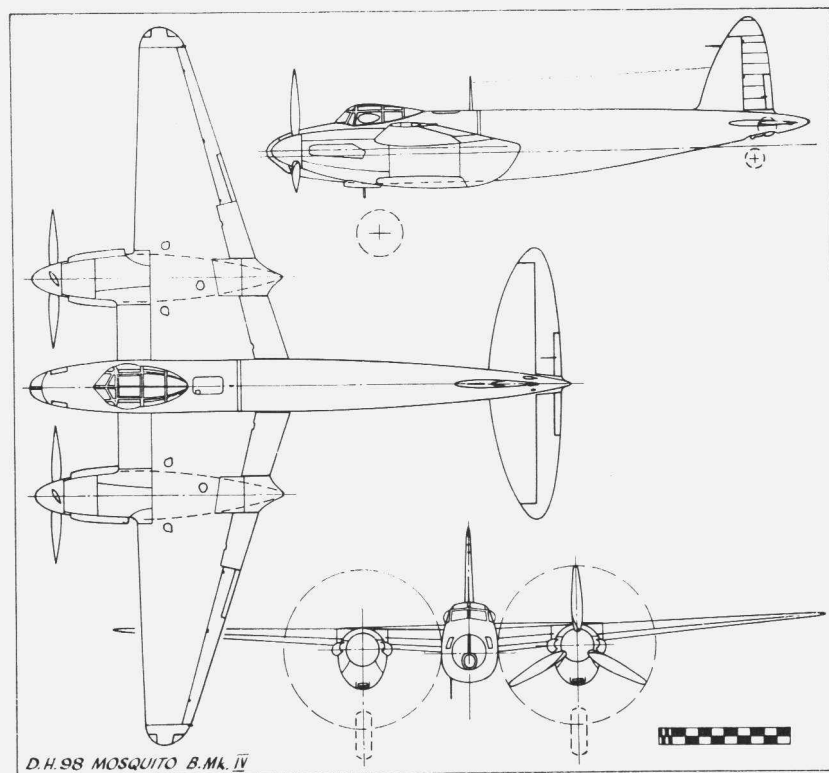
secret A.I. Mk. IV radar. Entry was by a door in the starboard side of the cockpit instead of through a trapdoor in the floor as in other versions. W4052 was also used for the development of night fighter tactics which included fitting a pneumatically operated segmented air brake round mid fuselage. Last of the three prototypes, the photo reconnaissance Mosquito I W4051, made its first flight on June 10, 1941 and was handed over to the Photographic Reconnaissance Unit at Benson in the following month. W4054 and W4055 followed it and these were the first Mosquitoes taken on R.A.F. charge. The first operational flight, a high altitude sortie to photograph enemy harbours at Brest and Bordeaux, was made by W4055 on September 20th.

A scheme to produce Mosquito turret fighters was short lived. The first flight of W4050 with a mock-up turret on July 24, 1941 was followed by an order for two more, W4053 and W4073 built at Salisbury Hall and flown out of its small field, also with dummy turrets, on 14 September and 5 December 1941 respectively. A considerable drag penalty combined with the good results obtained with the fixed gun fighter variant, ended the experiment but W4053 still had the turret when it landed at Colerne in September 1942.

Mosquito bombers and fighters were operational by May 1942 and from then on all three versions of the immortal "Mossie" were progressively developed to suit the changing military situation, becoming in the process ever faster, heavier and increasingly difficult to intercept. The first production bomber was the B. Mk. IV series 1 with increased tankage, ten of which were delivered after prototype trials with W4072, first flown on September 8, 1941. An early discovery showed that if bomb vanes were cropped it was possible to carry four 500 lb. instead of the intended 250 lb. type, doubling the Mosquito's hitting power before it even went into service. Initial deliveries included 263 B. Mk. IV series 2 aircraft identified by longer nacelles projecting aft of the wing and dividing the wing flaps. The first operation by B. Mk. IVs was a daylight attack on Cologne on May 31, 1942 by four aircraft of No. 105 Squadron, Marham which in company with the second Mosquito bomber squadron, No. 139, later carried out low level precision attacks all over Europe. These included the destruction of Gestapo H.Q. at Oslo on September 26, 1942, a feat resulting in a communiqué making public mention of the Mosquito for the first time. Modifications were then made to 26 aircraft for the carriage of a 4,000 lb. bomb, plus 50 gallon drop tanks under the outer wing panels, enabling Mosquitoes to reach and bomb Berlin for the first time on January 30, 1943. Later in the war a large number of B. Mk. IVs were converted by Marshalls, Cambridge, to carry an even greater load as torpedo bombers. The several trials aircraft included DZ594 with the first bulged bomb bay, DZ714 with H2S radar, DK290 with cut away bomb bay for dropping trials in connection with the Wallis anti-dam bomb, and LR495 with the wing mounted S.C.I. smoke curtain installation.

Bomber development was via the single B. Mk. V with strengthened

wing to carry two 500 lb. bombs or 100 gallon drop tanks, to 25 examples of the Packard Merlin 31 powered B. Mk. VII built by de Havilland Aircraft of Canada Ltd., the first of which, *KB300*, flew at Downsview on September 24, 1942. Commencing *LR495* came a batch of 54 British built high flying B. Mk. IXs with 1,680 h.p. Merlin 72 engines, the prototype being a converted B. Mk. IV *DZ540*. Two additional 500 lb. bombs were carried under the wings and in 1944 some were equipped with bulged bomb bays to accommodate a single 4,000 lb. 'block buster' while others were fitted with Oboe radar and diverted to pathfinding duties. Fifty-four

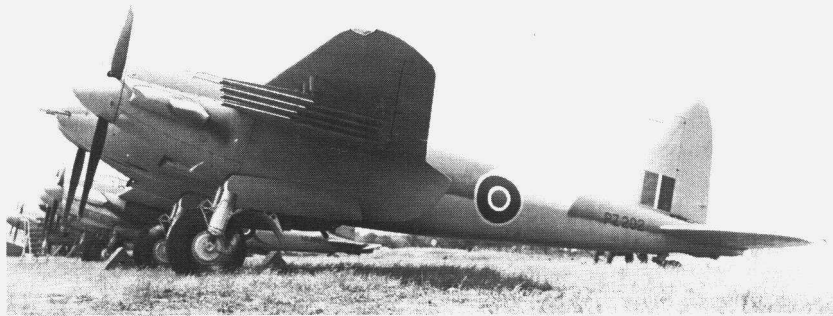


production B. Mk. IVs were also modified to carry the 4,000 lb. bomb. For night intruder operations by the eleven Mosquito squadrons of No. 8 Group, a development of the B. Mk. IX, designated B. Mk. XVI, was built with a pressure cabin and Marshall blower to permit full exploitation of high altitude Merlin 72 engines which gave a ceiling of 37,000 ft. A special Merlin 60 powered trials aircraft (*MP469*), first pressurised Mosquito, flew in November 1943, forerunner of 1,200 B. Mk. XVIs, many of which carried the 4,000 lb. bomb and auxiliary fuel tanks.

Canadian production progressed from the B. Mk. XX with American equipment via the Packard Merlin 69, arabic-mark-numbered, B. Mk. 23 project to the B. Mk. 25, 400 of which were produced with the Packard Merlin 225 operating at boost pressures of up to 18 lb./sq. in. When production ceased in October 1945, 1,134 Mosquitoes had been built in Canada, many of which established record times for the Atlantic crossing during routine delivery flights to the United Kingdom by the Northern Route, the best time, made in April 1945, being 5 hours 30 minutes. The final bomber variant was the Airspeed-built B. Mk. 35, the prototype of which flew on March 12, 1945 and the 122nd and last in August 1946. Powered by one Merlin 113 and one 114 with power take-off for the cabin blower, it was faster than, but otherwise similar to, the B. Mk. XVI and although too late for the war, formed the postwar equipment of Nos. 109 and 139 Squadrons at Hemswell.

The Mosquito's fighting career began when the first of 466 N.F. Mk. II aircraft entered Home Defence service with No. 23 Squadron at Ford in May and No. 157 Squadron at Castle Camps in August 1942. Later No. 23 Squadron took part in the defence of Malta and in operations over Italy. N.F. Mk. II *DD723* was equipped experimentally with underslung radiators and a Turbinlite in the nose. The F. Mk. II day fighter was dropped but a single example, *A52-1001*, was flown in Australia in 1942 and thereafter fighter variants were produced only in the fighter-bomber or night fighter category, the first and most widely used being the F.B. Mk. VI, 1,218 of which were built by the parent company, 1,200 by the Standard Motor Co. Ltd. and 300 by Airspeed Ltd. The prototype F.B. Mk. VI, a converted Mk. II *HJ662*, first flown in February 1943, was followed by 300 Merlin 21 or 23 powered F.B. Mk. VI series 1 aircraft which, in addition to full fighter armament carried two 250 lb. bombs in the bomb bay and two others under the mainplane. Subsequent aircraft known as the F.B. Mk. VI series 2 were fitted with Merlin 25s, strengthened to carry 500 lb. instead of 250 lb. bombs and were fitted for long range tanks.

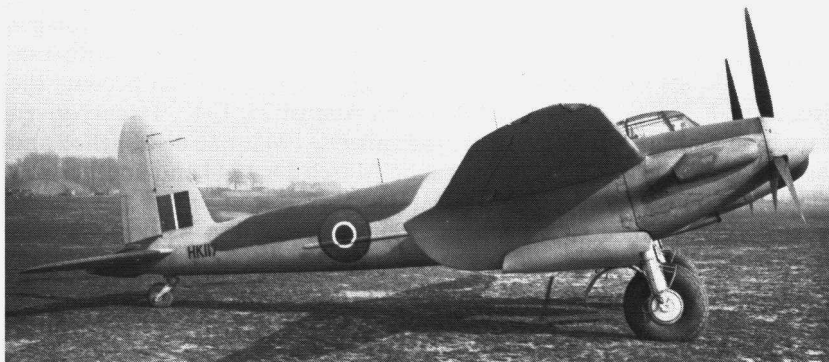
The Mosquito was the natural enemy of hostile shipping and to further this propensity a Mk. VI, *HJ732*, was fitted experimentally with one 57 mm. Molins quick firing gun, weighing nearly a ton, to become the prototype F.B. Mk. XVIII, first flown on August 25, 1943. Twenty-seven were built and first saw action on November 4, 1943; one also shelled and sank a U-boat near the French coast on March 25, 1944 and another was supplied to the United States Navy. Recoil problems ended the experiment in favour of a rocket projectile installation first made to *HJ719* early in 1943, eight 60 lb. rockets being equivalent to a broadside of 6 in. naval guns. Projected Mosquito F.B. Mk. X with Merlin 72 and XI with Merlin 61 engines were never built and the next types ordered in quantity were the Merlin 21 or 23 powered N.F. Mk. XII and XIII. These were fitted with A.I. Mk. VIII radar but in common with all later night fighting Mosquitoes, except the N.F. Mk. XV, carried four 20 mm. cannon instead



D.H.98 Mosquito F.B. Mk. VI PZ202 with rocket projectiles. (De Havilland Photo.)

of nose machine guns. The 97 N.F. Mk. XIIIs were converted Mk. IIs but the 270 Mk. XIIIIs, the first of which flew in February 1944, were new production aircraft, 100 Mk. IIs also being converted to N.F. Mk. XVII standard by the installation of A.I. Mk. X radar. Both the N.F. Mk. XVII and its derivative the N.F. Mk. XIX, 220 of which were built, were identified by an outsize bulbous nose housing the scanner, the newer mark having Merlin 25s and operating at the increased all-up weight of 21,750 lb.

To combat high flying reconnaissance by the Junkers Ju 86P, the pressurised prototype MP469 was converted for high altitude interception in 7 days, work begun on September 7, 1942 including the removal of 2,300 lb. of armour and equipment, the fitting of extended wings, small wheels and four .303 machine guns in the nose. John de Havilland flew it to 43,500 ft. and although it was never in action, five B. Mk. IV aircraft, including DZ366 and DZ385 were similarly converted to carry A.I. Mk. VIII radar and a four gun pack below the fuselage under the designa-



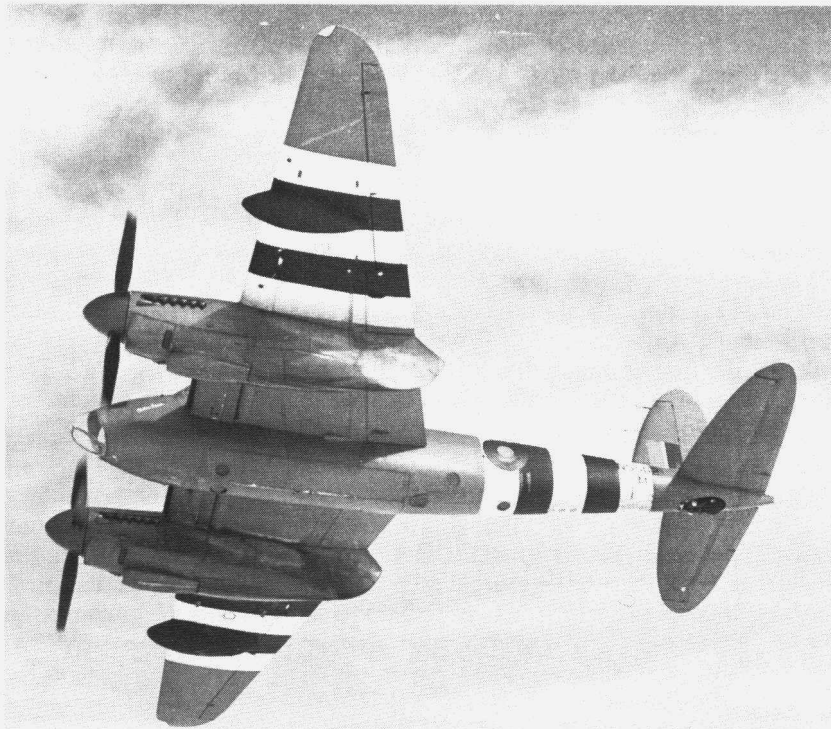
D.H.98 Mosquito N.F. Mk. XII HK117 photographed in March 1943.
(Crown Copyright Reserved.)

tion N.F. Mk. XV. Three examples of the F.B. Mk. 21, based on the F.B. Mk. VI and powered by the Packard Merlin 31 or 33, were built in Canada and followed by two F.B. Mk. 24s with Merlin 301s, and 338 examples of the F.B. Mk. 26 with Merlin 225s. Mark number 28 was not used, the next major developments being the T. Mk. 29 fighter/bomber trainer (50 converted from F.B. Mk. 26), and the Merlin 76 powered N.F. Mk. 30, over 230 of which, ending RK954, were built at Leavesden in 1945. The N.F. Mk 31 project with Packard Merlin 69s was not proceeded with. The next aircraft on the Leavesden production line, RK955, completed as the first N.F. Mk. 36 and flown in May 1945 had Merlin 113 engines, total production being 266. British A.I. Mk. IX radar replaced the American A.I. Mk. X in the last fighter variant, the N.F. Mk. 38, the first of which flew at Leavesden on November 18, 1947. The last 81 were built at Hawarden where the first machine flew on September 30, 1948 and the last, VX916, in November 1950.



43-34928, one of the batch of 40 Canadian-built F-8 Mosquitoes supplied to the U.S.A.A.F.

Photographic reconnaissance Mosquitoes achieved ever higher operational altitudes through the use of specially developed high flying Merlin 72 engines with two stage superchargers, first fitted to Mk. IV DZ385, to make the first of five Mosquito P.R. Mk. VIIIs which were followed by 90 examples of an astrodome-equipped photo-reconnaissance variant of the Mk. IX, fitted with Merlin 72 engines and designated P.R. Mk. IX. The first of the type flew on May 6, 1943 and thereafter Benson-based P.R. Mosquitoes of the R.A.F. and F-8 Mosquitoes of the 8th U.S. Air Force (40 of which had been supplied from the Canadian B. Mk. XX production line), kept the whole of Europe under daily surveillance and flew 3,000 photographic and meteorological sorties during 1943. At the end of the year the type also went into service in the Far East and during 1944 made an aerial survey of the whole of Burma and photographed all enemy seaports in Malaya and the Dutch East Indies.



Underneath view of Mosquito P.R. Mk. XVI *NS502* showing the circular camera apertures.

Still greater operational height was obtained when the pressure cabin came into use and a converted B. Mk. XVI, *MM258*, became the prototype P.R. Mk. XVI, 432 of which were built and carried the main P.R. responsibility until the end of the war. Additionally five aircraft, including *NS589*, were lightened and fitted with extended wing tips which increased the span of 58 ft. 10 in. and with Merlin 113 engines under the designation P.R. Mk. 32. A final version designated P.R. Mk. 34, a very long range aircraft for use with the South East Asia Command, had a range of over 3,500 miles, obtained by fitting a large overload fuel tank in the bomb bay and doubling the size of existing wing tanks to raise the total fuel to 1,255 gallons. Powered by the Merlin 113 and 114 and equipped with four F.52 vertical cameras and one F.24 oblique camera, the first production P.R. Mk. 34 flew on December 4, 1944 and 50 had been built at Luton by Percival Aircraft Ltd. before contracts were cancelled at the end of the war. They saw service with the postwar R.A.F. and some were modified by Marshalls, Cambridge to take Merlin 114A engines, improved Gee equipment and redesigned undercarriage retraction gear as the P.R. Mk. 34A. Final variants designated P.R. Mk. 35 and T.T. Mk. 35 were con-

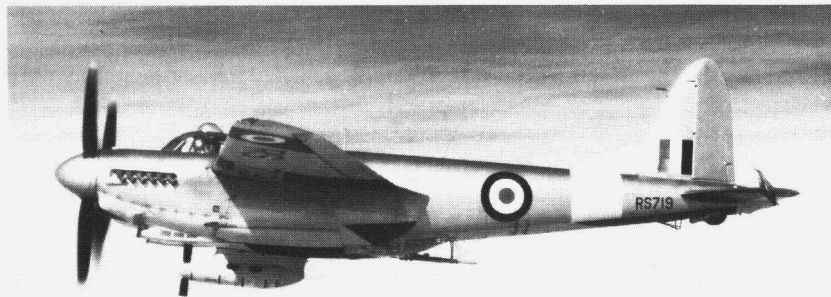
versions of the B. Mk. 35 for flashlight reconnaissance at night and target towing by civilian Anti-Aircraft Co-Operation Units respectively. The P.R. Mk. 35s emanated from Leavesden but T.T. Mk. 35 conversions were all made by Brooklands Aviation Ltd. They were of two types, a few early models (prototype *RS719*) with external M.L. Aviation Type G winch, and a much larger number with the winches inside modified bomb bays.

After the war Mosquito P.R. Mk. 34s *RG241* and *RG238* made record breaking flights. The first, flown by Wing Cdr. J. R. H. Merrifield D.S.O., D.F.C. and F/Lt. J. H. Spires D.F.C., D.F.M. made the east-west crossing of the Atlantic from St. Mawgan to Gander on September 6, 1945 in 7 hours and returned on October 23rd in 5 hours 10 minutes. The second, flown by Sqn. Ldr. H. B. Martin D.S.O., D.F.C. and Sqn. Ldr. E. Sismore, covered the 6,717 miles from London to Cape Town in 21 hours 31 minutes in May 1947 at an average speed of 279 m.p.h. The last operational Mosquitoes were those of No. 81 Squadron in Malaya where the final sortie was flown by P.R. Mk. 34A *RG314* on December 15, 1955.

The Mosquito N.F. Mk. 36 with A.I. Mk. 10 radar was the only all-weather fighter available to the R.A.F. before the advent of the Meteors and Vampires in 1951-52, the squadrons concerned being Nos. 23, 25, 29, 85, 141 and 264, each of which had eight aircraft. The last R.A.F. Mosquito sortie in Britain was probably the disposal flight of *RL201* of No. 23 Squadron from Coltishall to West Raynham on May 30, 1952.



Mosquito c/n 98624 under construction at Hatfield in 1943. (Keystone Photo.)



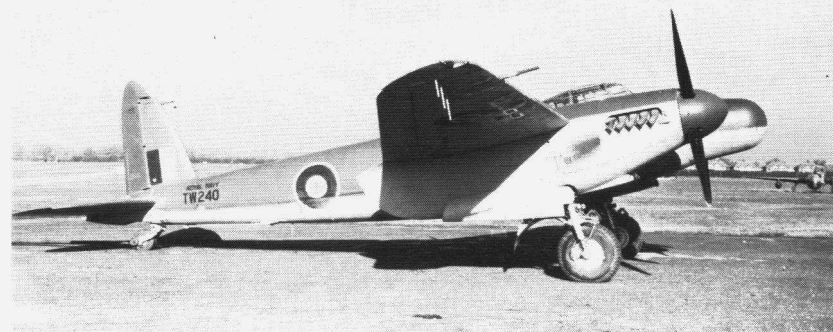
RS719, prototype Mosquito T.T. Mk. 35, showing the M.L. Type G winch and high speed target towing gear. (Crown Copyright reserved.)

A dual control trainer version first flown on January 30, 1942 and known as the T. Mk. III, was produced in small batches in 1943, at first by the conversion of F. Mk. II airframes and others were built in 1948–49 and remained in service with No. 204 Advanced Flying School and with the Operational Conversion Units of Bomber Command until 1953. A similar aircraft built in Canada with Merlin 33s was designated T. Mk. 22 and later, with Packard Merlin 225s, the T. Mk. 27. Fourteen T. Mk. III airframes destined for the R.A.A.F. as *A52-1002* to *A52-1015*, were shipped to Australia where Mosquito production using local timber began at Bankstown in 1942 using detailed component drawings, jigs and tools supplied by the parent company and de Havilland Aircraft of Canada Ltd. These used mark numbers in the 40 series, first of which was the F.B. Mk. 40 based on the Mk. VI, the first 100 aircraft being fitted with Packard Merlin 31s and the remaining 112 with Merlin 33s. The first machine, *A52-1*, first



Australian-built Mosquito F.B. Mk. 40s ready for delivery, 1944. (Imperial War Museum Photo HU.1642.)

flew at Sydney on July 23, 1943 and later under de Havilland supervision, the R.A.A.F. converted five F.B. Mk. 40s to P.R. Mk. 40 by replacing the armament with the usual complement of five vertical and oblique cameras. The first P.R. Mk. 40 flew on May 26, 1944 and the small fleet was used with success while the Japanese were being cleared from New Guinea in 1944. Chronologically the next Australian type was the T. Mk. 43, similar to the British T. Mk. III but converted from the R.A.A.F. F.B. Mk. 40 and the first, *A52-1050*, flew on June 27, 1946. The last 20 undelivered F.B. Mk. 40s and eight others selected from random from storage, were fitted with Packard Merlin 69 engines and full P.R. Mk. 40 camera installation as the P.R. Mk. 41, the first being *A52-300* delivered on May 29, 1947. This variant was used for an aerial survey of Australia completed in 1953. A single F.B. Mk. 42 also existed, created by the installation of



The prototype D.H.98 Sea Mosquito T.R. Mk. 37 TW240. (Crown Copyright Reserved.)

Packard Merlin 69s in F.B. Mk. 40 *A52-90* but no further conversions were made and the aircraft became the prototype P.R. Mk. 41 *A52-300*. Additional British built Mosquitoes used by the R.A.A.F. comprised 38 F.B. Mk. VIs *A52-500* to *A52-537* assembled at Bankstown in 1945 together with 23 P.R. Mk. XVI, *A52-600* to *A52-622* inclusive.

The varied career of the Mosquito included service at sea with the Royal Navy for which the Sea Mosquito was devised to Specification N.15/44. To prove feasibility, Mosquito F.B. Mk. VI *LR359* was fitted with arrester gear and became the first British twin engined type to land on an aircraft carrier when Lt. Cdr. E. M. Brown M.B.E., D.S.C. put it down on H.M.S. *Indefatigable* on March 25, 1944. Further trials were conducted at Boscombe Down with *TS446* and *TS449* but the first real Sea Mosquito with folding wings and nose radome was the former F.B. Mk. VI *LR387* equipped with large diameter four bladed airscrews. The first production aircraft, *TW227*, designated T.R. Mk. 33, first flew at Leavesden on November 10, 1945. Folding wings were fitted from the 14th aircraft *TW241*, which also had long travel Lockheed oleo legs in place of the rubber-in-compression units. All 50 production aircraft were equipped

to carry an 18 in. torpedo and two 50 gallon drop tanks which could be exchanged for the 30 gallon type if it was desired to carry two rocket projectiles. The type saw little service and merely replaced the Fleet Air Arm F.B. Mk. VI shore based aircraft of No. 811 Squadron during 1946–47. The Royal Navy also took delivery of six examples commencing VT724 of the T.R. Mk. 37, recognised by an enlarged nose accommodating the scanner of the British A.S.V. radar.



PF576, one of the Mosquitoes converted to T.T. Mk. 39 by General Aircraft Ltd., showing the camera operator's position in the nose.

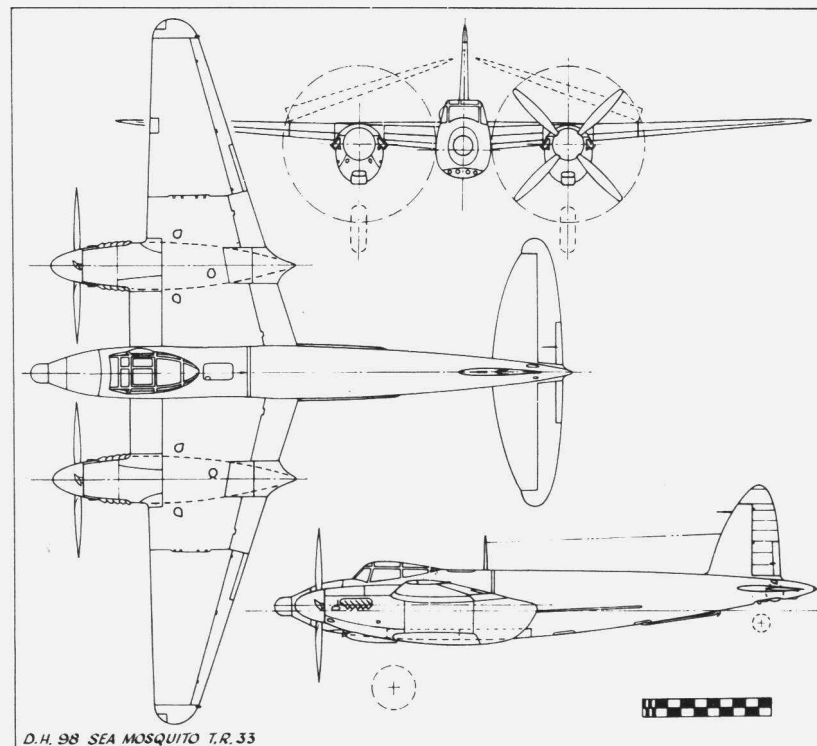
The ultimate Mosquito derivative was the T.T. Mk. 39 shore-based naval target tug to Specification Q.19/45, produced by the conversion of B. Mk. XVI at Hanworth by General Aircraft Ltd. who allotted their own type number G.A.L.59 to the work. This included lengthening the nose to provide glazed accommodation for a cameraman who recorded shell bursts; installing an electrically driven winch in the bomb bay and fitting a dorsal observation cupola for the winch operator. Powered by two Rolls-Royce Merlin 72/73 or 76/77 engines it was equipped to tow the 32 and 16 ft. span targets or a small drogue.

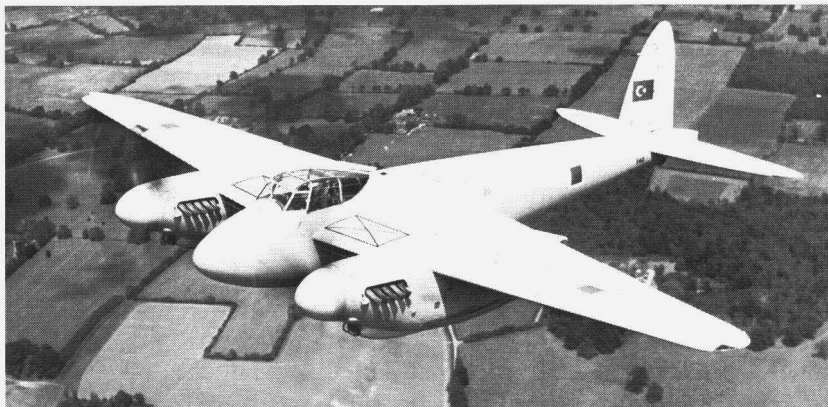
After the cancellation of the Miles E.24/43 research aircraft, Vickers pilotless, rocket propelled models were carried beneath a modified Mosquito B. Mk. XVI PF604 and dropped into the Atlantic off the Scilly Isles in 1947–48 for transonic research purposes by the R.A.E.

Of the grand total of 7,781 Mosquitoes built, 24 became British civil aircraft commencing with a Mk. IV and six Mk. VI machines converted at Hatfield and Bramcote respectively in 1943 for the carriage of diplomatic mail, newspapers and magazines on the B.O.A.C. wartime Leuchars–Stockholm route. On return trips bomb bays were filled with urgently needed ball bearings and the service operated in daylight despite determined attacks by German interceptor fighters. After Capt. Gilbert Rae was shot up by a Focke Wulf Fw 190 and made a forced landing in Sweden, the route was flown only at night and occasionally important

passengers were also carried—locked in the bomb bay with a supply of refreshments, reading material and oxygen. Three extra aircraft replaced losses in 1944 but so hazardous was the undertaking that only five survived when the service ceased in 1945. In March 1948 two P.R. Mk. 34s owned by the Ministry of Supply were based at Cranfield on loan to the B.E.A.C. Gust Research Unit as *G-AJZE* and *'ZF'* and for two years flew the length and breadth of Europe investigating clear air turbulence in readiness for the introduction of new turboprop and turbojet transports.

Although two Australian P.R. Mk. 41 aircraft *VH-WAD* and *VH-KLG* were fitted with Merlin 77 engines for entry in the London–Christchurch Air Race in 1953, the first was withdrawn by entrant Capt. J. Woods through lack of support and the other, piloted by Sqn. Ldr. A. J. R. Oates D.F.C. and F/Lt. D. H. Swain D.F.C., was ditched off the south west Burma coast on October 3rd while on its way to London. *VH-WAD* “The Quokka” was later sold to American owner D. Kubista and shipped from Perth, W.A., to Tucson Airport, Arizona. Several American F-8 Mosquitoes were entered for postwar races under United States civil marks but the civil Mosquito's chief postwar occupation was in the field of aerial survey. A number of P.R. Mk. 34As were converted for civil operation at Hatfield in 1955–56, some of which were delivered to





Dual control Mosquito T. Mk. III, serial 542, of the Turkish Air Force.

Fotogrametric Engineers Inc. in Los Angeles via the North Atlantic route while others went to the IREX Survey Co. for oil prospecting in Tripoli. The largest fleet was that of the Ottawa-based Spartan Air Services Ltd. which bought 15 Mosquito P.R. Mk. 35s in 1954 some of which were cannibalised and eventually broken up at Hurn, Hants. The five airworthy machines then remaining later performed high altitude photographic missions in Canada, the U.S.A., Mexico, Colombia, British Guiana, the Dominican Republic and Kenya.

After the war the ageing Mosquito still had considerable military potential and a large number of surplus machines were acquired at low cost by many nations. Some had already been used in Russia and several had been interned after making forced landings in Switzerland but post-war sales included 250 Canadian built machines to China and 238 B. Mk. VI and P.R. Mk. XVI to France. Other users of the B. Mk. VI were Turkey (T. Mk. IIIs also), Israel, Norway, Burma, Dominica and Jugoslavia (N.F. Mk. 38s and T. Mk. IIIs also). F.B. Mk. 30s and 36s were reconditioned at Ringway by the Fairey Aviation Co. Ltd. 1950-53 for the Belgian Air Force and N.F. Mk. XIXs were supplied to Sweden, which allotted its own designation J30 to sixty supplied in 1948. Mosquito B. Mk. VIs used by Czechoslovakia were given the Czech Air Force designation B-36 (LB-36 when equipped with German machine guns).

The Mosquito's last operational role was with No. 3 Civil Anti-Aircraft Co-operation Unit, based at Exeter, whose machines were retired in 1963 and shortly afterwards became stars of the film "633 Squadron". For this TT.35s *RS709*, *RS712*, *TA719*, were allocated the civil registrations *G-ASKA*, 'KB', 'KC' respectively, while the T.3 *RR299*, still maintained in airworthy condition by British Aerospace in 1987, became *G-ASKH*, *RS709*, having been re-registered *G-MOSI* in 1981 by the then owner D. W. Arnold, was flown across the Atlantic in October 1984 to join the U.S.A.F. Museum collection at Wright-Patterson A.F.B. where it will be repainted

to represent an F-8; *RS712*, after several years with the Strathallen Collection, was sold to American Collector Kermit Weeks for £100,000 in June 1981, registered *N35MK* and overhauled by Personal Plane Services at Booker but not delivered to Miami until 1986; *TA719* joined the Skyfame Museum at Staverton where it crashed while engaged in single-engined flying on July 27, 1964. In 1987 it was undergoing restoration at Duxford having been acquired by the Imperial War Museum.

It is a remarkable fact that the first prototype Mosquito *W4050* survived the war to be exhibited at the Radlett S.B.A.C. Show of September 1947. Five years later it was rediscovered in a shed at Chester and through the enthusiasm of a number of historically minded people in the industry, it was restored to its original condition, painted in wartime colours and provided with a specially built hangar at Salisbury Hall, its birthplace, where a small charge is made to see it. In October 1970 it was joined by a Mosquito T.T. Mk. 35, *TA634*, temporarily *G-AWJV* for the film "Mosquito Squadron" in 1968, which had been donated by the Liverpool Corporation. It was repainted for exhibition as *HX922* 'EF-G' in which Grp. Capt. Pickard had taken off from nearby Hunsdon for the famous Amiens Jail raid on February 18, 1944, never to return.

SPECIFICATION AND DATA

Manufacturers: The de Havilland Aircraft Co. Ltd., Hatfield and Leavesden Aerodromes, Herts.; and Hawarden Aerodrome, Chester
de Havilland Aircraft of Canada Ltd., Downsview Airport, Toronto
de Havilland Aircraft Pty. Ltd., Bankstown Aerodrome, Sydney, N.S.W.
Airspeed Ltd., Christchurch Aerodrome, Bournemouth, Hants.
The Standard Motor Co. Ltd.
Percival Aircraft Ltd., Luton Airport, Luton, Beds.

Power Plants: (Mk. I, II, III, IV, VI, XII, XIII, XVII)
Two 1,460 h.p. Rolls-Royce Merlin 21
(Mk. I, II, III, IV, V, VI, XII, XIII, XVII)
Two 1,460 h.p. Rolls-Royce Merlin 23
(Mk. VI, XVIII, XIX, 33, 37)
Two 1,635 h.p. Rolls-Royce Merlin 25
(Mk. VII, XX, 21, 40, F-8)
Two 1,460 h.p. Packard Merlin 31
(Mk. XX, 21, 22, 40, 43)
Two 1,460 h.p. Packard Merlin 33
(Mk. 33) Two 1,705 h.p. Rolls-Royce Merlin 66
(Mk. XIV) Two 1,705 h.p. Packard Merlin 67
(Mk. 23, 41, 42) Two 1,750 h.p. Packard Merlin 69
(Mk. VIII, IX, XIV, XV, XVI, 30, 39)
Two 1,680 h.p. Rolls-Royce Merlin 72 and 73*
(Mk. XV, XVI, 30, 39)
Two 1,710 h.p. Rolls-Royce Merlin 76 and 77*
(Mk. 30, 32, 34, 35, 36, 38)
Two 1,690 h.p. Rolls-Royce Merlin 113 and 114*
(Mk. 34A) Two 1,710 h.p. Rolls-Royce Merlin 114A
(Mk. 25, 26, 27) Two 1,620 Packard Merlin 225
(Mk. 24) Two 1,620 h.p. Packard Merlin 301

* Merlin 73, 77 and 114 had cabin blower and were not fitted to Mk. VIII, IX, 30 and 36.

Dimensions, Weights and Performances:

	P.R. Mk. I	F. Mk. II	T. Mk. III	B. Mk. IV	F.B. Mk. VI
Span	54 ft. 2 in.	54 ft. 2 in.	54 ft. 2 in.	54 ft. 2 in.	54 ft. 2 in.
Length	40 ft. 6 in.	40 ft. 6 in.	40 ft. 6 in.	40 ft. 6 in.	40 ft. 6 in.
Height	12 ft. 6 in.	12 ft. 6 in.	12 ft. 6 in.	12 ft. 6 in.	12 ft. 6 in.
Wing area	454 sq. ft.	454 sq. ft.	454 sq. ft.	454 sq. ft.	454 sq. ft.
Tare weight	12,824 lb.	13,431 lb.	13,104 lb.	13,400 lb.	14,344 lb.
All-up weight	19,670 lb.	18,547 lb.	16,883 lb.	21,462 lb.	22,258 lb.
Maximum speed	382 m.p.h.	370 m.p.h.	384 m.p.h.	380 m.p.h.	378 m.p.h.
Cruising speed	255 m.p.h.	255 m.p.h.	260 m.p.h.	265 m.p.h.	255 m.p.h.
Initial climb	2,850 ft./min.	3,000 ft./min.	2,500 ft./min.	2,500 ft./min.	2,850 ft./min.
Ceiling	35,000 ft.	36,000 ft.	37,500 ft.	34,000 ft.	33,000 ft.
Maximum range	2,180 miles	1,705 miles	1,560 miles	2,040 miles	1,855 miles
	P.R. Mk. VIII	P.R. Mk. IX	N.F. Mk. XII	N.F. Mk. XIII	N.F. Mk. XV
Span	54 ft. 2 in.	54 ft. 2 in.	54 ft. 2 in.	54 ft. 2 in.	62 ft. 6 in.
Length	40 ft. 6 in.	44 ft. 6 in.	40 ft. 6 in.	40 ft. 6 in.	44 ft. 6 in.
Height	12 ft. 6 in.	12 ft. 6 in.	12 ft. 6 in.	12 ft. 6 in.	12 ft. 6 in.
Wing area	454 sq. ft.	454 sq. ft.	454 sq. ft.	454 sq. ft.	479 sq. ft.
Tare weight	14,800 lb.	14,569 lb.	13,696 lb.	15,300 lb.	13,746 lb.
All-up weight	21,395 lb.	22,000 lb.	19,700 lb.	20,000 lb.	17,600 lb.
Maximum speed	436 m.p.h.	408 m.p.h.	370 m.p.h.	370 m.p.h.	412 m.p.h.
Cruising speed	258 m.p.h.	250 m.p.h.	255 m.p.h.	255 m.p.h.	230 m.p.h.
Initial climb	2,500 ft./min.	2,850 ft./min.	3,000 ft./min.	3,000 ft./min.	3,500 ft./min.
Ceiling	38,000 ft.	38,000 ft.	36,000 ft.	34,500 ft.	43,000 ft.
Maximum range	2,550 miles	2,450 miles	1,705 miles	1,860 miles	1,030 miles

	B. Mk. XVI	P.R. Mk. XVI	N.F. Mk. XVII	N.F. Mk. 30	T.R. Mk. 33
Span	54 ft. 2 in.	54 ft. 2 in.	54 ft. 2 in.	54 ft. 2 in.	54 ft. 2 in.
Length	44 ft. 6 in.	44 ft. 6 in.	40 ft. 6 in.	44 ft. 6 in.	40 ft. 6 in.
Height	12 ft. 6 in.	12 ft. 6 in.	12 ft. 6 in.	12 ft. 6 in.	12 ft. 6 in.
Wing area	454 sq. ft.	454 sq. ft.	454 sq. ft.	454 sq. ft.	454 sq. ft.
Tare weight	14,635 lb.	14,635 lb.	13,224 lb.	13,400 lb.	14,850 lb.
All-up weight	23,000 lb.	22,350 lb.	19,200 lb.	21,600 lb.	23,850 lb.
Maximum speed	408 m.p.h.	415 m.p.h.	370 m.p.h.	407 m.p.h.	376 m.p.h.
Cruising speed	245 m.p.h.	250 m.p.h.	255 m.p.h.	250 m.p.h.	262 m.p.h.
Initial climb	2,800 ft./min.	2,900 ft./min.	3,000 ft./min.	2,850 ft./min.	1,820 ft./min.
Ceiling	37,000 ft.	38,500 ft.	36,000 ft.	38,000 ft.	30,100 ft.
Maximum range	1,485 miles	2,450 miles	1,705 miles	1,300 miles	1,265 miles
	P.R. Mk. 34	B. Mk. 35	N.F. Mk. 38	T.T. Mk. 39	F.B. Mk. 40
Span	54 ft. 2 in.	54 ft. 2 in.	54 ft. 2 in.	54 ft. 2 in.	54 ft. 2 in.
Length	40 ft. 6 in.	40 ft. 6 in.	41 ft. 2 in.	43 ft. 4 in.	40 ft. 6 in.
Height	12 ft. 6 in.	12 ft. 6 in.	12 ft. 6 in.	12 ft. 6 in.	12 ft. 6 in.
Wing area	435 sq. ft.	435 sq. ft.	454 sq. ft.	454 sq. ft.	454 sq. ft.
Tare weight	14,180 lb.	14,635 lb.	16,000 lb.	15,980 lb.	14,344 lb.
All-up weight	22,100 lb.	23,000 lb.	21,400 lb.	23,000 lb.	22,258 lb.
Maximum speed	425 m.p.h.	415 m.p.h.	404 m.p.h.	299 m.p.h.	378 m.p.h.
Cruising speed	300 m.p.h.	276 m.p.h.	—	—	255 m.p.h.
Initial climb	2,000 ft./min.	2,700 ft./min.	—	—	2,400 ft./min.
Ceiling	43,000 ft.	42,000 ft.	36,000 ft.	—	33,000 ft.
Maximum range	3,340 miles	1,955 miles	—	—	1,855 miles

Production:

(a) Totals

Manufacturer	Number built	Manufacturer	Number built
D.H. Hatfield	3,349	D.H. Australia	212
D.H. Leavesden	1,566	Airspeed	122
D.H. Chester	65	Standard	1,066
D.H. Canada	1,034	Percival	245

(b) Initial Hatfield production

c/n	Serial		c/n	Serial	
98001	<i>W4050</i>	Prototype	98024	<i>W4073</i>	Turret fighter
98002	<i>W4052</i>	Fighter proto.	98025, 27, 29	<i>W4074, 76, 78</i>	N.F. Mk. II
98003	<i>W4051</i>	P.R. prototype	98026, 28	<i>W4075, 77</i>	T. Mk. III
98004	<i>W4053</i>	Turret fighter	98030, 32, 34	<i>W4079, 81, 83</i>	T. Mk. III
98005-07	<i>W4054-56</i>	P.R. Mk. I	98031, 33, 35	<i>W4080, 82, 84</i>	N.F. Mk. II
98008	<i>W4057</i>	B. Mk. V proto.	98036	<i>W4085</i>	N.F. Mk. II
98009-14	<i>W4058-63</i>	P.R. Mk. I	98037-50	<i>W4086-99</i>	N.F. Mk. II
98015-23	<i>W4064-72</i>	B. Mk. IV conv.	98051-80	<i>DD600-629</i>	N.F. Mk. II

(c) Further production

Mark	Serial ranges
N.F. Mk. II	<i>DD630-644, 659-691, 712-759, 777-800, DZ228-238, 240-272, 286-310, 653-661, 680-727, 739-761, HJ642-661, 699-715, 911-946(a), HK107-141(a), 159-204(a), 222-265(a), 278-327(a), 348-382(a)</i>
T. Mk. III	<i>HJ852-899(a), 958-999(a), LR516-541(a), 553-585(a), RR270-319(a), TV954-984(a), TW101-119(a), VA871-894(a), 923-928(a), VR330-349, VT581-596, 604-631</i>
F.B., B. and P.R. Mk. IV	<i>DK284-303, 308-333, 336-339, DZ311-320, 340-341, 343-388, 405-423, 425-442, 458-497, 515-538, 540-559, 575-618, 630-652</i>
F.B. Mk. VI	<i>HJ662-682, 716-743, 755-792, 808-823, HP848-888(b), 904-942, 967-989, HR113-162, 175-220, 236-262, 279-312, 331-375, 387-415, 432-465, 485-527, 536-580, 603-647, HX802-835, 851-869, 896-922, 937-984, LR248-276, 289-313, 327-340, 343-389, 402-404, MM398-423, 426-431, NS819-859, 873-914, 926-965, 977-999, NT112-156, 169-199, 201-207, 219-223, 226-238, PZ161-203, 217-250, 253-259, 273-299, 302-316, 330-358, 371-419, 435-466, 471-476, RF580-625(b), 639-681, 695-736, 749-793, 818-859, 873-915, 928-966, RS501-535, 548-581, 593-633, 637-680(c), 693-698(c), SZ958-999, TA113-122, 369-388, 469-508, 523-560, 575-603, TE587-628(b), 640-669, 683-725, 738-780, 793-830, 848-889, 905-932, VL726-732(c)</i>

Mark	Serial ranges
F.B. Mk. VIII P.R. Mk. IX B. Mk. IX N.F. Mk. XII N.F. Mk. XIII	DZ342, 404, 424 and 24 conversions LR405-446, 459-476, 478-481, MM227-257 LR477, LR495-513, ML921-924 HJ944-945(a), HK107-141, 159-204, 222-236 HK363-381(a), 396-437(a), 453-481(a), 499-536(a)(d), MM436-479, 491-534, 547-590, 615-623
B. Mk. XVI	MP469, ML896-920, 925-942, 956-999, MM112-156, 169-205, 219-226, PF379-415, 428-469, 481-526, 538-579, 592-619, RV295-326, 340-363, TA614-616
P.R. Mk. XVI	MM258, 271-314(e), 327-371, 384-397(e), NS496-538(e), 551-596, 619-660(e), 673-712, 725-758, 772-816(e), RF969-999, RG113-158, 171-175
N.F. Mk. XVII F.B. Mk. XVIII	HK237-265(a), 278-327, 344-362 MM424-425, NT200, NT224-225, 592-593, PZ251-252, 300-301, 467-470
N.F. Mk. XIX	MM624-656, 669-686, TA123-156, 169-198, 215-249, 263-308, 323-357, 389-413, 425-449
N.F. Mk. 30	MM687-710, 726-769, 783-822, MT456-499(a), MV521-570(a), NT241-283(a), 295-336(a), 349-393(a), 415-458(a), 471-513(a), 526-568(a), 582-621(a), RK929-954
T.R. Mk. 33 P.R. Mk. 34 B. Mk. 35	TW227-257, 277-295 PF620-635, 647-680, RG176-215, 228-269, 283-318, VL613-625 RS699-723, RV364-367, TA617-618, 633-670, 685-724, TH977-999, TJ113-158, TK591-635, 648-656, VP178-202, VR792-806
N.F. Mk. 36 T.F. Mk. 37 N.F. Mk. 38	RK955-960, 972-999, RL113-158, 173-215, 229-268 VT724-737 VT651-683, 691-707, VX860-879, VX886-916

Note—Duplicated serials indicate conversions and additional information is given thus—

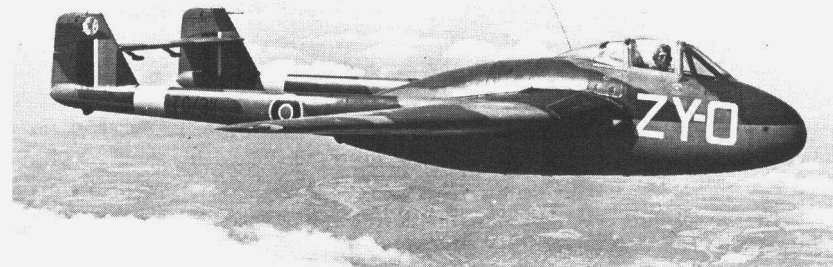
- (a) Leavesden-built (d) Duplicated Avro Lancaster serials
(b) Standard-built (e) Some supplied to the U.S.A.A.F.
(c) Airspeed-built

(d) Built by de Havilland Aircraft Pty. Ltd.

F.B. Mk. 40 P.R. Mk. 40 P.R. Mk. 41 F.B. Mk. 42 T. Mk. 43	A52-1 to A52-212 Converted from F.B. Mk. 40s A52-2, 4, 6, 7, 9, 26 A52-300 to A52-327 Conversion of F.B. Mk. 40 A52-90, became P.R. Mk. 41 A52-300 A52-1050 to A52-1071
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(e) Built by de Havilland Aircraft of Canada Ltd.

B. Mk. VII F-8 B. Mk. XX F.B. Mk. 21 T. Mk. 22 F.B. Mk. 24 B. Mk. 25 F.B. Mk. 26 T. Mk. 27	KB300-324 43-34924 to 43-34963 KB100-179, 325-329 (Merlin 31); KB180-299, 330-369 (Merlin 33) KA100-101 (Merlin 31); KA102 (Merlin 33) KA873-876 KA928-929 (only one completed) KA930-999, KB370-699 KA103-440 (KA441-773 cancelled) KA877-926
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Vampire F. Mk. I TG311 of No. 247 Squadron. (Crown Copyright reserved.)

De Havilland D.H.100 Vampire

Designed to Specification E.6/41, the prototype Vampire single seat, interceptor jet fighter LZ548/G was first flown at Hatfield by Geoffrey de Havilland Jnr. on September 29, 1943, 16 months after the commencement of detail designs. It was an all metal aircraft except for the Mosquito style plywood and balsa cockpit section. The engine, a 2,700 lb. s.t. Goblin 1 turbojet designed by Maj. F. B. Halford and manufactured by the de Havilland company, was fitted behind the pilot in a short nacelle. Consequently the tail unit was mounted on twin booms and for compressibility reasons the tailplane was set high on tall pointed fins. Airscrew clearance being a thing of the past, the aircraft sat low to the ground on a short legged retractable nose wheel undercarriage.

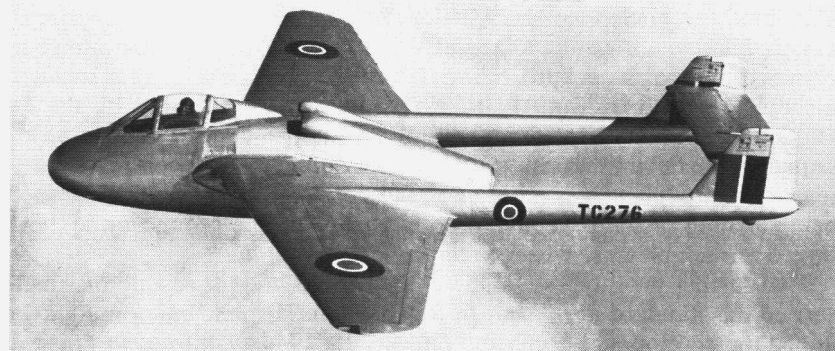
Two further prototypes, LZ551/G and MP838/G, the second of which carried the standard armament of four 20 mm. Hispano cannon, quickly joined the development trials and on May 13, 1944 a contract was placed for 120 (later increased to 300) Vampire F. Mk. Is to be built in the Preston works of the English Electric Co. Ltd. Production aircraft commencing TG274/G, first flown at Samlesbury on April 20, 1945, were the first fighters of any nation with a top speed above 500 m.p.h. and were identified by square cut vertical tail surfaces. Many of the initial batch of



The prototype D.H.100 Vampire LZ548/G at Hatfield a few days before its first flight in September 1943, showing the original fins. (De Havilland Photo.)

40 were used for test purposes including the squadron evaluation of *TG277*; R.A.E. tests with *TG279* in the course of which it crashed at Newbury on September 12, 1945; engine and armament development with *TG282* and *TG284*; English Electric trials with *TG287* and aerodynamic tests using tip mounted cameras on *TG289*. The 41st Vampire F. Mk. I *TG314* and subsequent aircraft were powered by the 3,100 lb.s.t. Goblin 2 and equipped with Mosquito slipper tanks. Cockpits were pressurised from the 51st aircraft *TG336*, and equipped with one-piece canopies commencing *TG386* in January 1946.

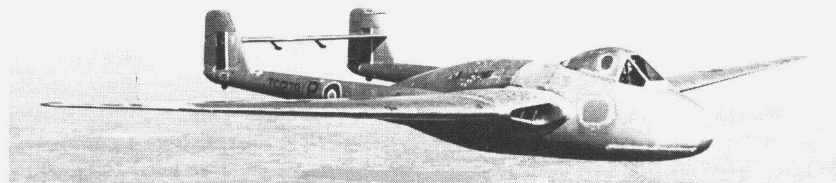
Vampires were too late for the Second World War but from 1946–51 were used by the Second Tactical Air Force in Germany and the Odiham-based Vampire wing of Fighter Command, their public debut being the fly-past over London by No. 247 Squadron during the victory celebrations of June 8, 1946. Replacing Mosquitoes of No. 605 (County of Warwick) Squadron at Honiley on July 3, 1948 the Vampire became the first jet aircraft issued to the Royal Auxiliary Air Force.



The prototype Vampire II, *TG276*, with Rolls-Royce Nene I engine and 'elephant ear' intakes. (Rolls-Royce Photo.)

The early production Vampires *TG276*, *TG280* and *TX807*, experimentally fitted with Rolls-Royce Nene I engines to Specification F.11/45, were identified by 'elephant ear' intakes on top of the nacelle which fed air to the double sided impellers. They were used for performance and engine trials under the designation Vampire II. Boulton Paul Ltd. later modified *TX807* to dispense with the dorsal intakes and later shipped it to Australia, where as *A78-2* it served as the development vehicle for the Nene powered F. Mk. 30 discussed on page 426.

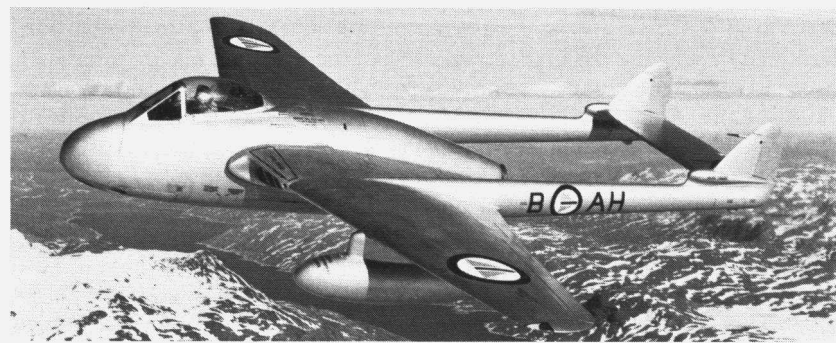
The third production aircraft, *TG278*, with a 4 ft. extension to each wing tip and special hood, flew on May 8, 1947 as a testbed for the de Havilland Ghost turbojet and for high altitude trials in the course of which John Cunningham established a new World's altitude record of 59,446 ft. on March 23, 1948. This Vampire was later fitted with a Mk. 3 tailplane during development of a Ghost engined production version initially designated



The Ghost engined, high altitude Vampire *TG278* in which John Cunningham reached 59,446 ft. on March 23, 1948. (Charles E. Brown Photo.)

Vampire Mk. 8 but eventually built as the D.H.112 Venom. The fuselages of *TG283* and *TG306* were donated to the D.H.108 programme, the special nose section for which was flown on Vampire *TG281* and the high speed canopy for *TG306* on *TG443*. One Vampire F. Mk. I was supplied to the R.C.A.F. and another, *TG372*, went to Canada for winterisation trials. Swiss requirements were met by fitting *TG433* with a 3,300 lb.s.t. Goblin 3, and certain modifications, as the prototype Vampire F.B. Mk. 6 prior to a Swiss Government purchase of four Vampire F. Mk. Is commencing *J-1001* and seventy-five F.B. Mk. 6s. The Swedish Air Force also re-equipped with 70 Vampire F. Mk. Is, the first of which, *28001*, was delivered in March 1946. They were allotted the Swedish designation J28 and some had Swedish-built Goblins. When superseded many were sold to the Dominican Government as fighter-bombers and some to Austria with civil marks.

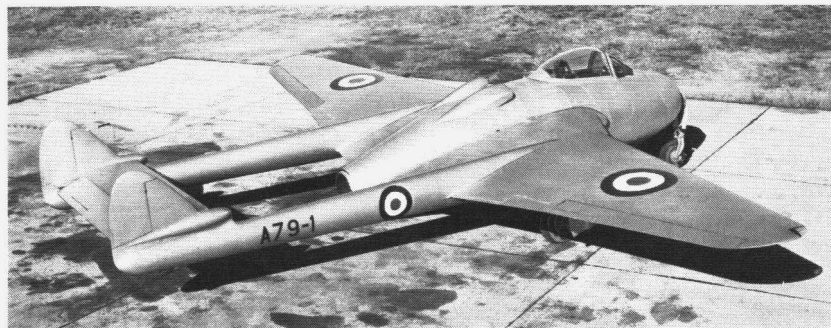
Drop tank experiments with *TG275* led to the standardisation of the 100 gallon pylon-mounted, cylindrical type but whatever their size and position they had an adverse effect on the Vampire's longitudinal stability. This was overcome by increasing tailplane chord by 4½ in., reducing that of the elevator by 1½ in. and fitting acorns to the fin and tail junctions. Tests having shown that tailplane position did not affect compressibility characteristics, the opportunity was taken to simplify manufacture by lowering the tailplane 13 in. to a position still clear of the jet efflux.



A Vampire F. Mk. III, with pylon-mounted long range tanks and revised tail surfaces, in service with the Royal Norwegian Air Force. (Charles E. Brown Photo.)

Vertical tail surfaces were changed to the standard D.H. shape, a long range wing increased total internal tankage to 326 gallons and provision was made for 100 or 200 gallon drop tanks. In this form it became the prototype Vampire F. Mk. III, first flown on November 4, 1946 but in accordance with the new policy to use arabic type numbers, production was to Specification F.3/47 as the Vampire F. Mk. 3, commencing at Preston with *VF335*. Service trials and type development aircraft were *VF343* and *VF345*. The new mark then replaced the Vampire F. Mk. I both in Germany and the U.K., six aircraft *VT863*, *864*, *868*, *869*, *871* and *873* of No. 54 Squadron, Odiham being the first jet fighters to fly the Atlantic under their own power. Together with two 'met.' Mosquitoes, they reached Goose Bay via Iceland and Greenland on July 14, 1948 to take part in displays and exercises in Canada and the U.S.A.

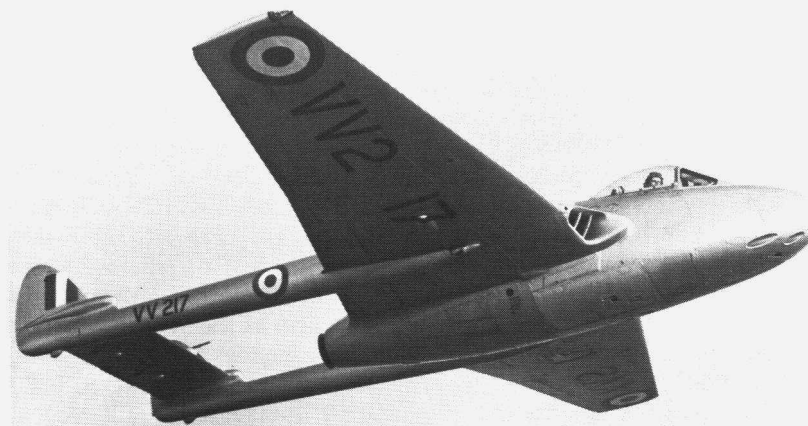
At the end of April 1948 *VV190* was used as a flying testbed for the Goblin 4 and Vampire F. Mk. 3 *VG703* completed 15 months weathering and tropical trials in Singapore, the Philippines and Khartoum on



A79-1, prototype of the Australian-built Vampire F.B. Mk. 30 with Rolls-Royce Nene 2-VH.

October 21, 1949. Four were delivered by air to the Royal Norwegian Air Force, 83, commencing *17001*, equipped four R.C.A.F. fighter squadrons and Vampire F. Mk. I *TG431* was sent to Australia as *A78-1* for evaluation. Vampire IV was the designation allotted to the Vampire III airframe with Rolls-Royce Nene engine but none were built in Britain and the type was developed in Australia as the F. Mk. 30, eighty examples of which were constructed by de Havilland Aircraft Pty. Ltd. and powered by Australian built Rolls-Royce Nene 2-VH engines. The prototype, *A79-1*, was first flown by test pilot Brian Walker on June 29, 1948.

Trials with Vampire F. Mk. I *TG444* with wing clipped to 38 ft. span, first flown on June 29, 1948, preceded the introduction of the Vampire F.B. Mk. 5, a ground attack variant with the wing strengthened for carrying bombs or rocket projectiles and having square cut tips to reduce the span by 2 ft. The heavier airframe also called for a long stroke undercarriage. The first production F.B. Mk. 5 flew on June 23, 1948 after



D.H.100 Vampire F.B. Mk. 5 *VV217* with square cut, short span mainplane. This aircraft was later used for the trial installation of Sea Vixen nose wheel steering.

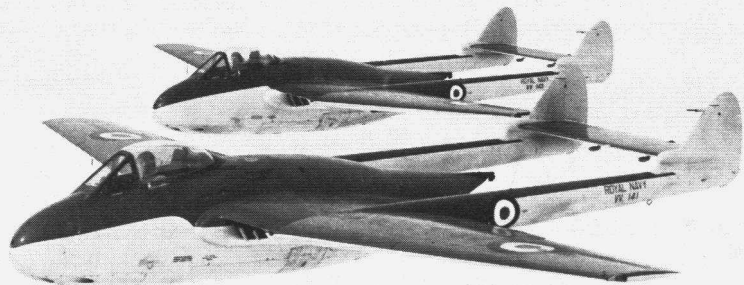
which the type operated with the F.E.A.F. against Malayan terrorists and replaced earlier marks in the U.K. and Germany. One example, *VV465*, was sent to Australia where, as *A78-3*, it was forerunner of 29 F. Mk. 30s reworked to F.B. Mk. 5 standard as F.B. Mk. 31s. Serial numbers of Australian-built Vampires were scrambled to the extent that one of the 80 F. Mk. 30s was *A79-737*, and this is believed to have been that converted as the solitary F. Mk. 32 test flown late in 1951 with cockpit air conditioning unit. All Mk. 30 and 31 aircraft were later modified with belly air intakes as the cockpit canopy interfered with the airflow to the original 'elephant ear' intakes.

Following John Derry's masterly demonstration of *VV218* at the Farnborough S.B.A.C. Show in September 1948, considerable overseas interest was aroused and the prototype F.B. Mk. 51 export fighter *VV568*



The eighth Vampire F. Mk. 6 for the Swiss Air Force. *J-1008* flew back to Hatfield on August 20, 1974 for the Mosquito Museum, Salisbury Hall.

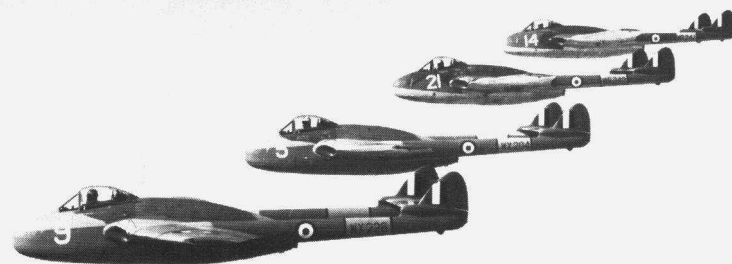
was despatched to France for Nene development along with 30 ex R.A.F. aircraft for L'Armée de l'Air. VZ253 was sold to the Italian Government, an export version designated F.B. Mk. 50 satisfied the 2nd and 3rd Swedish contracts and the F.B. Mk. 52, based on the F. Mk. 6, was supplied to Egypt, Finland, Iraq, Lebanon, Norway and Venezuela. Standard F.B. Mk. 5s were also delivered to the Indian Air Force and to the S.A.A.F. A large number built under licence 1950–53 included 85 F. Mk. 6s by Swiss factories; 80 F.B. Mk. 52As in Italy by Macchi and Fiat; 67 Goblin powered F.B. Mk. 5s assembled in France from British built components by S.N.C.A. du Sud-Est, the first of which flew at Marignane on December 21, 1950; and 183 Goblin powered Vampire 5s preceding 250 F.B. Mk. 53s built by the same firm as the SE-535 Mistral. The Mistrals were fitted with French-built Nene engines but differed from the Australian F. Mk. 30 and the projected French Nene powered F.B. Mk. 51 equivalents because the 'elephant ear' intakes were replaced by



Sea Vampire F. Mk. 20s VV141 and VV143 of the Royal Navy, showing the arrestor hook stowage on top of the jet pipe. ('Flight' Photo 22637.)

the enlarged wing root ducts developed by Boulton Paul Ltd. The first Mistral flew on April 2, 1951; one was used as a testbed for the SNECMA reverse thrust system in 1952; and Mme. Auriol broke the Women's World Speed Record in another on May 12, 1951 by averaging 515 m.p.h. round a 100 km. course between Istres and Avignon.

Experience with the Vampire F.B. Mk. 5 in the Near and Far East led to the production of a tropical version designated F.B. Mk. 9 with cockpit air conditioning and Godfrey refrigerating equipment in the mainplane which led to the sole recognition feature—an 8 in. increase in the length of the starboard wing fillet. It was the last single seat Vampire used by the R.A.F. and when production ceased at WX260 in December 1953, 1,157 Vampires had been produced including 792 at Chester and about 50 F.B. Mk. 9s commencing WR205 at Ringway by the Fairey Aviation Co. Ltd. in 1952–53. This total includes export F.B. Mk. 9s to the R.N.Z.A.F. under redesignation as F.B. Mk. 25s, but excludes those built for the Indian Air Force by Hindustan Aircraft Ltd. When replaced by Venoms



A formation of Royal Air Force Vampire F.B. Mk. 9s.

in 1954–55, Vampire F.B. Mk. 5s were handed over to Flying Training Command as ground attack and rocket firing trainers. Experiments included in manufacturer's and R.A.E. test programmes comprised after-burning tests with extended tail pipe and Mk. I tail unit on VV454; transonic speed tests with models on a wing sleeve fitted to F. Mk. 3 VF343; and boundary layer suction research by the R.A.E. and Cambridge University using F. Mk. 3 VT858 in 1953–55.

The Royal Navy evinced early interest in the Vampire and at the Christchurch factory the second prototype, LZ551, was given a 40% increase in flap area by continuing them under the booms, long travel oleo legs and an arrestor hook for deck landing trials which commenced on H.M.S. *Ocean* on December 3, 1945. Redesignated Sea Vampire 10 and piloted by Lt. Cdr. E. M. Brown R.N.V.R., it was the first pure jet aeroplane ever to operate from a carrier. The second 'hooked Vampire', a conversion of the 91st production F. Mk. 1 TG426, was followed by two fully navalised prototypes VF315 and TG328 and a batch of 18 production Sea Vampire F. Mk. 20s the first of which, VV136, flew in October 1948 and the last, VV165, in June 1949. They were navalised adaptations of the F.B. Mk. 5 with clipped wings strengthened for accelerated take off, enlarged dive brakes and flaps and long travel oleo legs, the chief recognition feature being the A frame arrestor hook in its housing above the jet pipe. Sea Vampires were used for the Royal Navy's jet

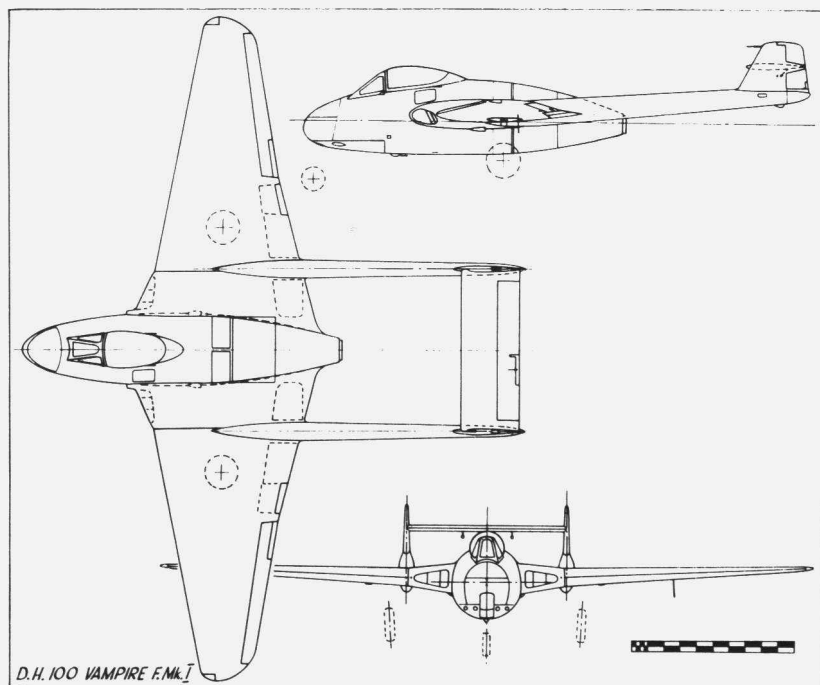


N41J, former R.C.A.F. Vampire Mk. 3 17051, in private use at Oakland, California in 1957. (G. R. Price Photo.)

familiarisation programme which culminated in the delivery of two seat Sea Vampire T. Mk. 22s. During 'Exercise Sunrise', Lts. G. Baldwin D.S.C. and K. Shepherd of the Carrier Trials Unit made over 200 deck landings in Sea Vampire Mk. 20s, a small force of which also embarked in H.M.S. *Vengeance* for interception exercises in the North Atlantic and Arctic areas in 1950.

At least three Sea Vampire F. Mk. 21s, including the former F. Mk. I *TG286* and F. Mk. 3 *VT802*, were given strengthened undersides for experimental landings with undercarriage retracted on rubberised decking on H.M.S. *Warrior* early in 1949 and on the dummy rubber deck at Farnborough up to 1953, to test the feasibility of undercarriageless shipborne aircraft.

'Civil' activities by Vampires commenced at Lympne on August 31, 1947 when John Cunningham raised the Class C.1/1 100 km. closed circuit speed record to 496.88 m.p.h. in F. Mk. I *VF332*. They were twice entered for the Kemsley Trophy Race, in which the same pilot came second at 470 m.p.h. in the Goblin 4 testbed *VV190* at Elmdon on July 30, 1949 and J. W. Wilson 5th at 445 m.p.h. in F.B. Mk. 9 *WR211* at Woolsington on July 11, 1952. At least 39 surplus R.C.A.F. Mk. 3s were demilitarised and sold to Fliteways of West Bend, Wisconsin in 1954 for distribution in the U.S.A. as fast private 'hacks' or executive aircraft. *17069* became *N6877D* but later returned to Canada as *CF-RLK*



for the Calgary Squadron of the Confederate Air Force and was shown at the Calgary Centennial Planetarium in 1972. *17072* was used for aerobatic displays in an all-gold colour scheme as *N6878D* by John Morgan. It later spent some years in storage before a painstaking restoration to flying condition by Pete Regina at Van Nuys, California and flew again on April 8, 1972 in No. 502 Squadron camouflage as *VN68*, coded YG.

SPECIFICATION AND DATA

Manufacturers: The de Havilland Aircraft Co. Ltd., Hatfield Aerodrome, Herts., Hawarden Aerodrome, Chester and Christchurch Aerodrome, Hants.
The English Electric Co. Ltd., Preston, Lancs.
The Fairey Aviation Co. Ltd., Ringway Aerodrome, Manchester
de Havilland Aircraft Pty. Ltd. Bankstown Aerodrome, Sydney, N.S.W.
Hindustan Aircraft Ltd., Bangalore, India
Société Nationale de Constructions Aéronautiques du Sud-Est, Marignane Aerodrome, Marseilles, France
Società per Azioni Fiat, Turin, Italy
Aeronautica Macchi S.A., Varese, Italy
A combine formed by the Swiss Federal Aircraft Plant, Emmen; Flug. und Fahrzeugwerke A.G., Altenrhein; and Pilatus Flugzeugwerke A.G., Stans, Switzerland

Power Plants: (Prototypes) One 2,700 lb. s.t. de Havilland Goblin 1
(Mk. I, 3, 5, 10 and 20) One 3,100 lb. s.t. de Havilland Goblin 2
One 4,400 lb. s.t. de Havilland Ghost 2/2
(Mk. II and IV) One 4,500 lb. s.t. Rolls-Royce Nene 1
(Mk. 6, 9, 50, 51 and 52) One 3,350 lb. s.t. de Havilland Goblin 3
(Mk. 30) One 5,000 lb. s.t. Commonwealth Aircraft Corporation Nene 2-VH
(Mk. 51 and 53) One 5,000 lb. s.t. Hispano-Suiza Nene 102B
(Mk. 52A) One 3,100 lb. s.t. de Havilland Goblin 2

Dimensions: Span (Mks. I-IV) 40 ft. 0 in. (Mk. I altitude record) 48 ft. 0 in.
(Other marks) 38 ft. 0 in.
Length 30 ft. 9 in. Height 8 ft. 10 in.
Wing area (Mks. I-IV) 266 sq. ft. (Other marks) 262 sq. ft.

Weights and Performances:

	F. Mk. 1	F. Mk. 3	F.B. Mk. 5	F.B. Mk. 6
Tare weight . . .	6,372 lb.	7,134 lb.	7,253 lb.	7,283 lb.
All-up weight . . .	10,480 lb.	11,970 lb.	12,360 lb.	12,390 lb.
Maximum speed . . .	540 m.p.h.	531 m.p.h.	535 m.p.h.	548 m.p.h.
Initial climb . . .	4,300 ft./min.	4,350 ft./min.	4,050 ft./min.	4,800 ft./min.
Ceiling . . .	—	43,500 ft.	40,000 ft.	—
Range . . .	730 miles	1,145 miles	1,170 miles	1,220 miles

	F.B. Mk. 9	F. Mk. 20	F.B. Mk. 30	F.B. Mk. 53
Tare weight . . .	7,283 lb.	7,623 lb.	7,600 lb.	7,656 lb.
All-up weight . . .	12,390 lb.	12,660 lb.	11,000 lb.	12,628 lb.
Maximum speed . . .	548 m.p.h.	526 m.p.h.	570 m.p.h.	568 m.p.h.
Initial climb . . .	4,800 ft./min.	4,300 ft./min.	4,500 ft./min.	4,500 ft./min.
Ceiling . . .	—	43,500 ft.	49,000 ft.	44,000 ft.
Range . . .	1,220 miles	1,140 miles	—	—

Production:

- (a) In the United Kingdom, de Havilland constructor's numbers commencing V0001; English Electric commencing 42001.

(Duplicated serials show conversion to later mark)

Mark	Serial ranges
Prototypes	LZ548/G, LZ551/G, MP838/G
F. Mk. I	TG274-315, 328-355, 370-389, 419-448, VF265-283, 300-334; Sweden 28001-28070; Swiss J1001-J1004
Mk. II	TG276, TG280, TX807
F. Mk. III	TG275, VF335-348
F. Mk. 3	VF317, VG692-703, VT793-835, 854-874, VV187-213; R.C.A.F. 17001-17086(a); Norway
F.B. Mk. 5	VV214-232, 443-490, 525-569, 600-611, 614-640, 655-700, 717-736(b), VX461-464, 471-476, 950-990, VZ105-155, 161-197, 206-241, 251-290, 300-359(c), 808-852, 860-877, WA101-150, 159-208, 215-264, 271-320, 329-348, 355-403, 411-460, WE830-849, WG793-807, 826-847; R.A.A.F. A78-1 to A78-41; R.N.Z.A.F. NZ5721-5738, 5750-5778(d); S.A.A.F. 201-210, 248-254; Indian e.g. HB733; Italy MM6000-MM6004(c); Egypt; Venezuela
F. Mk. 6	Swiss J1005-J1089
F.B. Mk. 9	WG848-851, 865-892, 922-931, WL493-518, 547-587, 602-616, and in the WP, WR and WX series, ending WX260; R.R.A.F. 101-115(e); Jordan F-600 to F-609(e); Ceylon CF510-511
F. Mk. 20	TG328, VF315, VG701, VT795, 803-805, VV136-165(f)
F. Mk. 21	TG286, VT802
F.B. Mk. 50	Sweden (designation J.28B)
F.B. Mk. 51	France
F.B. Mk. 52	Egypt 1500-1549; Finland VA-1 to VA-6; Iraq 336-344, 389-391; Jordan F-610 to F-616(g); Lebanon L-150 to L-153, 155-158; Norway
F.B. Mk. 52A	Italy

Notes— (a) Some civilianised at R.C.A.F. Malton in 1954 with U.S. civil markings as follows: 17002/N6865D; 17007/N6880D; 17016/N6870D; 17018/N6881D; 17019/N6874D; 17020/N6863D; 17030/N6861D; 17031/N41J; 17038/N6876D; 17044/N6866D; 17047/N6872D; 17058/N6860D; 17062/N6865D; 17065/N6872D; 17067/N6879D; 17069/N6877D/CF-RLK; 17071/N6883D; 17078/N6867D; 17085/N6868D/VN68

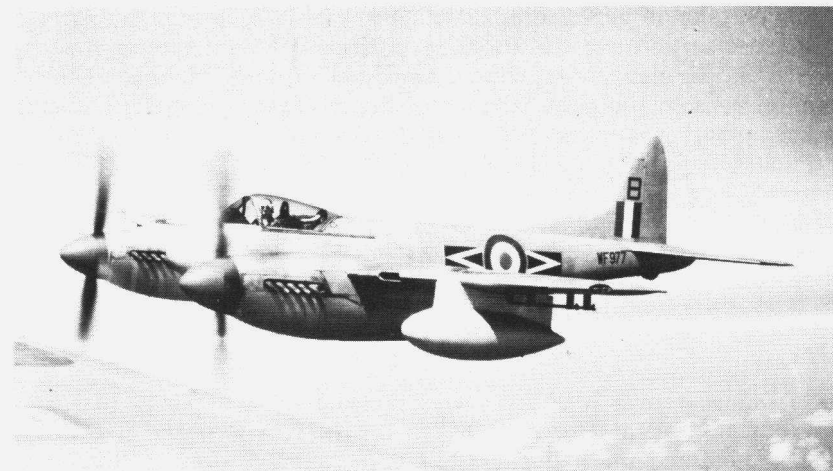
- (b) 17 of this batch to France (e) Ex R.A.F., Italian were VZ252-256
(c) Compromised Sea Fury batch (f) Documented as 18 aircraft
(d) Including some F.B. Mk. 9s (g) Ex-Egyptian aircraft

(b) In Switzerland

100 Vampire F.B. Mk. 6s commencing J-1101

(c) In Australia

80 Vampire F. Mk. 30 with 'scrambled' serials in A79 range, constructor's numbers commencing 4000
29 F. Mk. 30s converted to F.B. Mk. 31
1 F. Mk. 30 converted to Mk. 32



A D.H.103 Hornet F. Mk. 4 WF977 of No. 80 Squadron with long range tanks and rocket projectiles. The dorsal fin eventually graced Hornets of all marks.

De Havilland D.H.103 Hornet

The exceptional operational success of the Mosquito led, in 1942, to the idea of a scaled down single seat version to be known as the Hornet and capable of meeting single engine Japanese fighters in combat among the islands of the South Pacific. Very long range had therefore to be added to normal medium altitude fighter characteristics and perfected streamlining would contribute largely to its success. To this end Rolls-Royce Ltd. closely collaborated with de Havillands and developed special Merlin power plants of minimum frontal area. These permitted an exceptionally sleek installation which was a feature of the mock up shown to Ministry of Aircraft Production officials at Hatfield in January 1943. Permission to build was not received until the following June when the Hornet ceased to be a private venture and Specification F.12/43 was written round it.

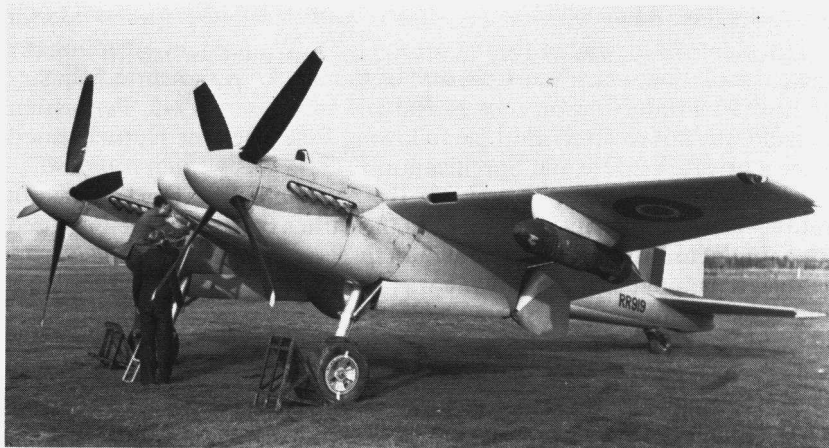
Although superficially resembling the Mosquito, the Hornet was an entirely new design only identical with the earlier type in the method used for manufacturing the slim, oval section fuselage. The one piece, two spar, cantilever laminar flow mainplane was designed to high strength factors and consisted of a composite wood and metal internal structure with a stressed birch ply double upper skin and an undersurface of reinforced Alclad. The Hornet was the first type of aircraft in which wood was cemented to metal, a unique method of construction only possible by using the revolutionary new Redux adhesive. Four bladed de Havilland Hydromatic airscrews driven by a Rolls-Royce Merlin 130 in the starboard nacelle and a Merlin 131 in the port were inward rotating to eliminate

swing on take off and landing. Cooling was by leading edge radiators in the centre section and the aircraft represented the ultimate in airscrew driven fighter design. Armament consisted of four 20 mm. Hispano cannon beneath the pilot, who sat in the extreme nose under a sliding canopy with a magnificent view in all directions.

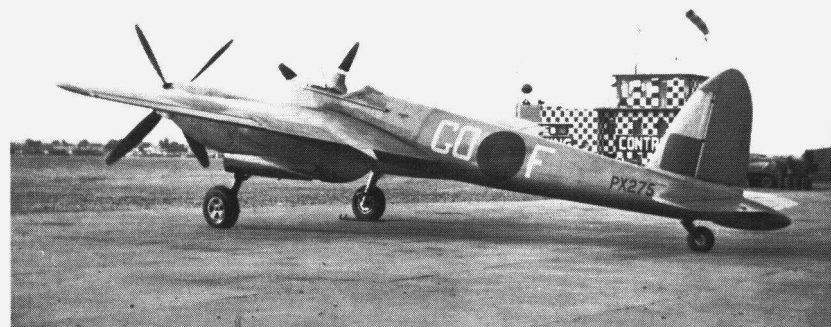
Piloted by Geoffrey de Havilland Jnr., the first prototype, *RR915*, flew from Hatfield for the first time on July 28, 1944 only 13 months after the commencement of detail designs. Calculated performance was met handsomely, manoeuvrability and climb were exceptional and the prototype reached 485 m.p.h., a speed probably never exceeded by any other airscrew driven aeroplane. In the first 60 days' trials by Geoffrey de Havilland and G. H. Pike, 50½ hours were flown and a second prototype, *RR919*, was completed with two 200 gallon drop tanks under the wings, which gave a range of over 2,500 miles when cruising at 340 m.p.h. at 30,000 ft.

Production of the Hornet F. Mk. 1 for the R.A.F. began at Hatfield late in 1944 and the first aircraft, *PX210*, was delivered to Boscombe Down on February 28, 1945 but the war with Japan was over before any reached the Pacific. Production Hornets were only marginally slower than the prototype and one gave an unprecedented display of air to ground firing at Boscombe Down in the following August. On October 29th the Hornet was shown publicly for the first time when *PX237* attended the R.A.E. At Home. The Hornet's intended alternative role in the Pacific was photographic reconnaissance and prototypes of the P.R. Mk. 2, *PX216*, *PX220* and *PX249*, with rear fuselage mounted cameras, followed naturally. Five other P.R. Mk. 2s were produced but the rest of the order was cancelled and they were scrapped.

Hornet F. Mk. 3 aircraft, prototype *PX312*, (and batch commencing *PX289*) were equipped with wider tailplanes, larger elevator horn balances



The second prototype D.H.103 Hornet, *RR919*, at Hatfield with under-wing bombs in November 1944.



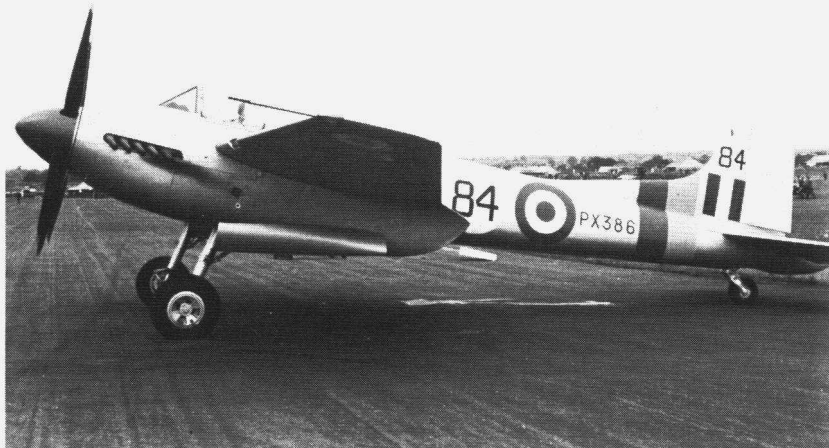
Hornet F. Mk. 1 *PX275* wearing the coding of the Air Fighting Development Squadron. (A. J. Jackson Photo.)

and two 200 gallon underwing tanks which could be removed for the carriage of two 1,000 lb. bombs. Internal tankage was increased from 360 to 540 gallons to give the Hornet a 40% increase in range. The public debut of the F. Mk. 3 was made by *PX366* at an exhibition organised at Farnborough in June 1946, after which the type remained in production at Hatfield until the jigs were moved to Chester late in 1948. The first Chester-built Hornet flew in March 1949 and at the completion of the last contract in June 1952, a total of 211 Hornets had been delivered to the R.A.F. Production F. Mk. 3s were fitted with a curved dorsal fin, later retrospectively fitted to all Hornets to improve stability at high speeds.

The first Hornet-equipped squadron was No. 64 which took part in the Victory Fly Past over London on June 8, 1946 from its base at Horsham St. Faith. No. 19 Squadron formed with Hornets at Church Fenton in the following October. Nos. 41 and 65 Squadrons were similarly equipped later, those of No. 65 being chosen to fly to Uppsala on May 20, 1948 to pay an official visit to the Swedish Air Force. They returned on the 27th after a formation flight over Stockholm. On September 15, 1949 one of two Hornets detailed to participate in Battle of Britain celebrations at Gibraltar, was flown out from Bovingdon by F/Lt. H. Peebles at an average speed of 357·565 m.p.h. to establish a British point to point record. On the return journey on September 19th, Gp. Capt. A. C. P. Carver flew to Bovingdon under strict cruise control at the tropopause in 2 hours 30 minutes 21 seconds, and landed with 15 minutes fuel left in his tanks, setting up a new record at 435·871 m.p.h.

In a near-civil capacity, Hornet F. Mk. 1 *PX224* piloted by G. H. Pike came third in the High Speed Handicap Race at 343·5 m.p.h. at Lympne on August 31, 1946. Three years later *PX386*, a new F. Mk. 3 powered by 2,030 h.p. Merlin 133/134 engines, took part in the National Air Races at Elmdon on July 30, 1949 under the aegis of two de Havilland directors.

Entered by W. E. Nixon and flown by R. W. Jamieson it was unplaced in the Kemsley Challenge Trophy Race but flown by G. H. Pike as F. T. Hearle's entry for the Air League Challenge Cup, it came second and made the fastest time of 353 m.p.h.



Hornet F. Mk. 3 PX386 numbered 84 for participation in the National Air Races at Elmdon on July 30, 1949. (A. J. Jackson Photo.)

The R.A.F. declared all early Hornet F. Mk. 1 aircraft obsolete in 1950 but in the following year most of Fighter Command's F. Mk. 3s were despatched to Malaya for use by the Far East Air Force. They were then equipped with underwing rails for eight rocket projectiles or racks for two 1,000 lb. bombs for highly successful attacks against jungle terrorists and were the last piston engined R.A.F. fighters to see active service. The final batch consisted of 23 aircraft, the last 12 of which were fitted with one F.52 vertically mounted camera under the designation Hornet F. Mk. 4. They were in effect F. Mk. 3 aircraft with the 60 gallon top fuel tank replaced by a smaller one holding 46 gallons in order to make room for the camera.

SPECIFICATION AND DATA

Manufacturers: The de Havilland Aircraft Co. Ltd., Hatfield Aerodrome, Herts., production transferred to Hawarden Aerodrome, Chester in 1948

Power Plants: Two 2,070 h.p. Rolls-Royce Merlin 130 or 131
Two 2,030 h.p. Rolls-Royce Merlin 133 or 134

Dimensions: Span 45 ft. 0 in. Length 36 ft. 8 in.
Height 14 ft. 2 in. Wing area 361 sq. ft.

Weights: (F. Mk. 1) Tare weight 12,502 lb. All-up weight 17,700 lb.
(F. Mk. 3) Tare weight 12,880 lb. All-up weight 20,900 lb.

Performance: (F. Mk. 1) Maximum speed 472 m.p.h.* Initial climb 4,000 ft./min.
Ceiling 37,500 ft. Range 2,500 miles
(F. Mk. 3) Maximum speed 472 m.p.h.* Initial climb 4,000 ft./min.
Ceiling 35,000 ft. Range 3,000 miles

* At 22,000 ft.

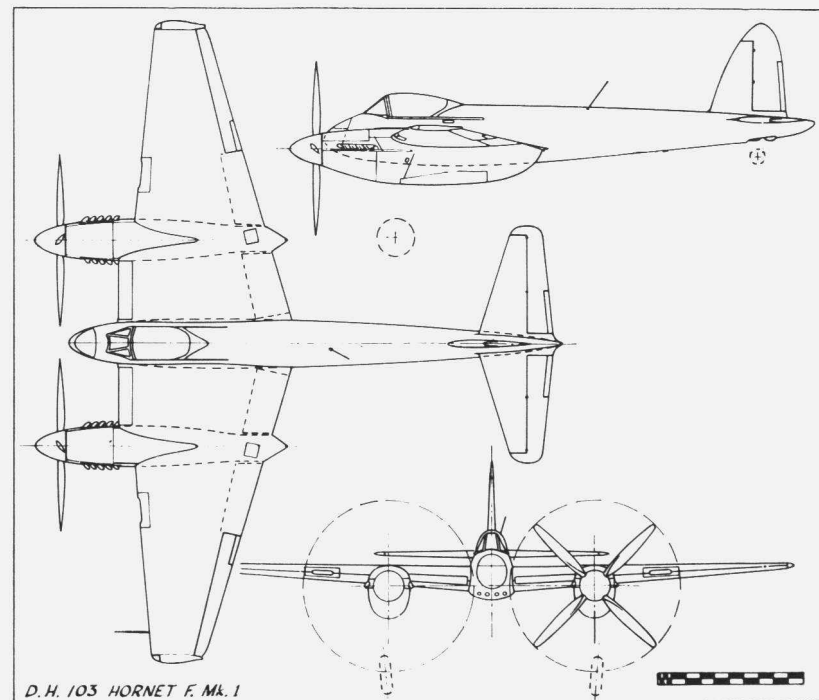
Production:

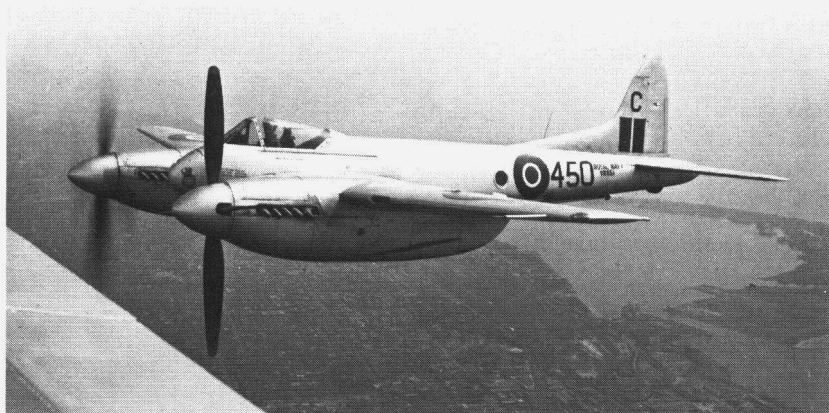
Mark	Serial range	Mark	Serial range
Prototypes	RR915, RR919	F. Mk. 3	PX399-PX425**
F. Mk. 1	PX210-PX253		PX440-PX446**
	PX273-PX288		WB870-WB889
P.R. Mk. 2	VA962-VA966*		WB897-WB912
F. Mk. 3	PX289-PX315		WF954-WF962
	PX328-PX369	F.R. Mk. 4	WF966-WF967
	PX383-PX398		WF968-WF979

* Built and scrapped.

** Contract cancelled.

Service Use: (a) Fighter Command: No. 19 Sqn. Church Fenton, No. 41 Sqn., No. 64 Sqn. Horsham St. Faith, No. 65 Sqn.
(b) In the Far East with Nos. 33, 45 and 80 Sqdns.





Sea Hornet F. Mk. 20 VR851, one of three loaned to No. 806 Squadron for exhibition flying at New York in 1948, flying over Toronto Harbour on one engine.

De Havilland D.H.103 Sea Hornet

During the early stages of the Hornet project, the possibility of carrier based action against the Japanese had not been overlooked and for this reason opposite handed engines and the high drag flaps needed for power-on approach had been incorporated in the design. Late in 1944 prototypes of a Fleet Air Arm version were put in hand and three early production Hornet F. Mk. 1s were selected for naval modification to Specification N.5/44. Design work was entrusted to the Heston Aircraft Co. Ltd. who produced a wing with Lockheed hydraulic power-folding similar to that of the Sea Mosquito, a forged steel arrester hook on a flush fitting external V frame, tail down accelerator pick-up points, and mountings for specialised naval radar and radio equipment. The de Havilland company also supplied Airdraulic undercarriage legs to replace the existing rubber-in-compression units which were unable to absorb the high rate of descent usual in deck landings. The weight penalty of these modifications totalled 550 lb.

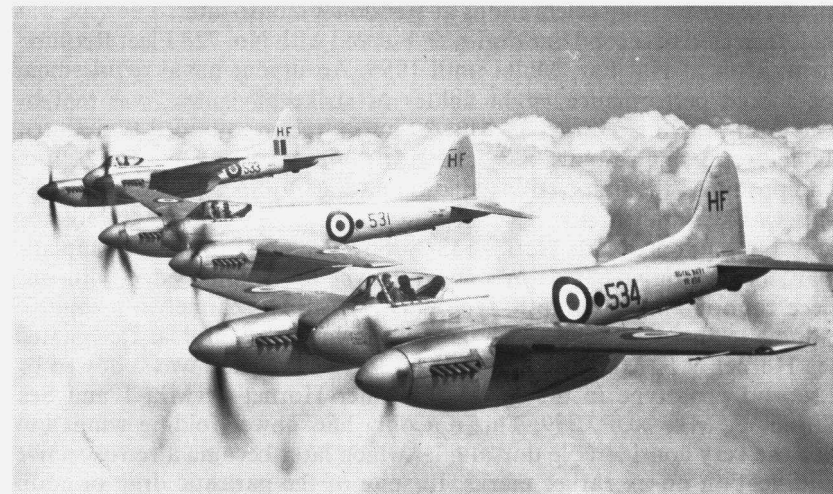
The first prototype, PX212, flew on April 19, 1945 and like the second aircraft PX214, was merely a hooked Hornet with a standard non-folding mainplane. Both were shown to the public for the first time at a Press Show at Heston on October 2nd but PX219, the first to fly with full naval modifications and folding mainplane, had already commenced trial landings on the Light Fleet Carrier H.M.S. *Ocean* on August 10th. A production order was then placed for the Royal Navy's first twin engined, long range escort strike fighter, designated Sea Hornet F. Mk. 20. The

first production aircraft, TT186, with slotted flaps, flew at Hatfield on August 13, 1946 and went to Lee-on-Solent with several others for service trials with No. 703 Squadron. Armament was similar to the R.A.F. counterpart and consisted of four 20 mm. Hispano cannon in the nose, two 1,000 lb. bombs under the mainplane and alternative provision for eight 60 lb. rocket projectiles. Camera windows were built into the rear fuselage for optional F.R. Mk. 20 capability. During deck landing trials it was found that side loads on the undercarriage caused torque link trouble which necessitated the fitting of redesigned main legs, tests with which began on H.M.S. *Illustrious* on October 11, 1948.

No. 801 Squadron re-formed at Ford with Sea Hornets on June 1, 1947 and later went to Arbroath before embarking in H.M.S. *Implacable* in 1949. Sea Hornets remained in service until 1951 and three aircraft were attached to No. 806 Squadron to form part of a composite naval group which embarked in the Light Fleet Carrier H.M.C.S. *Magnificent* on May 25, 1948. After completing eight weeks training in Canada they went to New York to give memorable flying demonstrations at the International Air Exposition held from July 31st to August 8th.

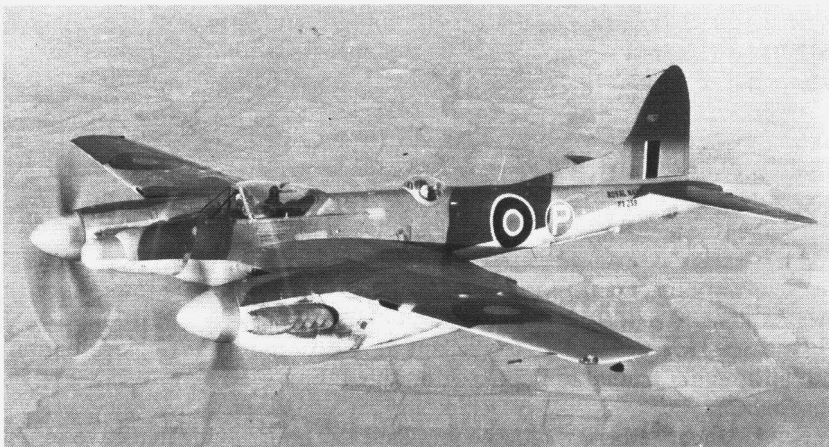
One Sea Hornet F. Mk. 20 was sent to Australia for R.A.N. evaluation but although intended to be A83-1, retained the Royal Navy serial TT213 throughout.

Sea Hornet F. Mk. 20 TT193 completed 190 hours flying in its two years Service life up to July 1, 1950 with the Fleet Air Arm in the U.K. and with the R.C.A.F. at Edmonton, Alberta. It was then acquired by Spartan Air Services Ltd., the Mosquito-equipped Ottawa survey company, and on June 28, 1951 was issued with a restricted C. of A. as a three seat civil



Sea Hornet F. Mk. 20s of No. 728 Fleet Requirements Unit, Hal Far, Malta in 1954.
(Crown Copyright Reserved.)

photographic aircraft *CF-GUO*, operating at the increased all-up weight of 18,700 lb. In the following April it was sold to Field Aviation Ltd. but on July 11, 1952 the starboard engine blew up while on a photographic mission in the Prince George area of British Columbia. After a successful forced landing at Terrace B.C., it was given away locally through lack of spares.



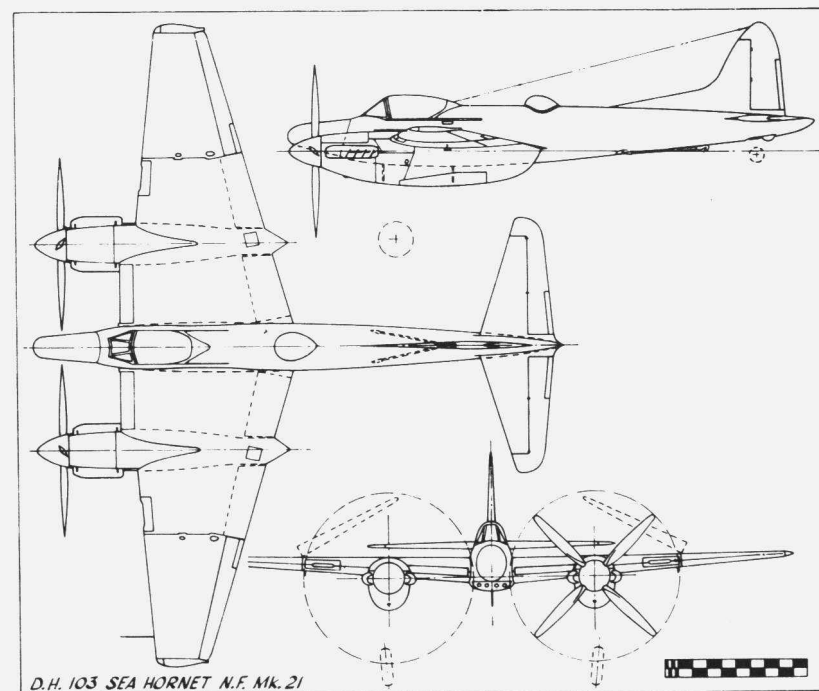
The second prototype Sea Hornet N.F. Mk. 21, *PX239*, showing the thimble radome and exhaust flame dampers.

Production of the Sea Hornet F. Mk. 20 ended on June 12, 1951 with the delivery of *WE247*, one of the last, *WE241*, forming an exhibit at the Fifty Years of Flying celebrations at Hendon a month later. The type was then relegated to second line duties and served with No. 728 Fleet Requirements Unit at Hal Far, Malta until 1955. An urgent naval requirement for a high performance, night fighter or strike navigator, was met by converting the Sea Hornet F. Mk. 20 into a radar equipped two seater. As before, design responsibility rested with the Heston Aircraft Co. Ltd. who produced the first trial installation aircraft to Specification N.21/45. This was again an R.A.F. Hornet F. Mk. 1, *PX230*, without the folding wing but equipped with Merlin 133/34 power plants; increased tailplane span; heated radar-navigator's cockpit over the trailing edge with one piece canopy and separate K type dinghy; A.S.H. scanner in a thimble radome in the nose; and flame damping exhaust manifolds. Designated Sea Hornet N.F. Mk. 21, it first flew on July 9, 1946 and was followed by a second prototype in the shape of former Hornet F. Mk. 1 and Sea Hornet F. Mk. 20 *PX239*. This not only had power folding wings but also the very considerable dorsal fillet which later became a retrospective modification on all earlier marks. In spite of the parasitic drag of additional equipment, the N.F. Mk. 21 was only 5 m.p.h. slower than its predecessor and first deck landing trials on H.M.S. *Illustrious* on October

25, 1948 proved so satisfactory that night landings followed almost immediately.

Production aircraft commencing *VV430* were built in the Hatfield factory but towards the end of 1948 the jigs were moved to Hawarden Aerodrome, Chester where further Sea Hornets were built. The 78th and final Sea Hornet N.F. Mk. 21 was *VZ699*, and total production of Sea Hornets of all marks amounted to 198 machines. Satisfactory tests by the Service Trials Unit and the Naval Air Fighting Development Unit at Ford resulted in No. 809 Squadron being re-formed with the type at Culdrose on January 20, 1949. It was the only front line squadron so equipped and in 1950 embarked in H.M.S. *Vengeance*, which in October of that year was steaming off Gibraltar. When therefore certain of No. 809 Squadron's aircraft were recalled to Lee-on-Solent, the Royal Navy was given an opportunity of emulating the R.A.F. flights of the previous year. On October 16th four Sea Hornet N.F. Mk. 21s flew in formation at 18,000 ft., nonstop from Gibraltar to Lee, covering the 1,040 miles in 3 hours 10 minutes at an average speed of 330 m.p.h. On November 24th a fifth aircraft piloted by Lt. D. M. Browse R.N., with Lt. H. E. Hunt R.N. navigating, covered the distance in only 2 hours 45 minutes.

The two seaters were relegated to second line squadrons and radar training duties in 1954 and continued in limited service until the majority



were broken up at Yeovilton two years later. Forty-three examples of a photographic reconnaissance version known as the Sea Hornet P.R. Mk. 22 were also delivered to the Fleet Air Arm, closely resembling the F. Mk. 20 but fitted with two F.52 cameras for day reconnaissance or one Fairchild K.19B for night use. It could also carry standard underwing armament and was virtually a navalised version of the R.A.F.'s Hornet P.R. Mk. 2. The prototype was *TT187*, and one of the first production aircraft, *VZ658*, was exhibited with three vertical cameras installed at the S.B.A.C. Show at Farnborough in September 1948.

SPECIFICATION AND DATA

Manufacturers: The de Havilland Aircraft Co. Ltd., Hatfield Aerodrome, Herts., production transferred to Hawarden Aerodrome, Chester in 1948

Power Plants: Two 2,070 h.p. Rolls-Royce Merlin 130 and 131
Two 2,030 h.p. Rolls-Royce Merlin 133 and 134

Dimensions: Span 45 ft. 0 in. Length 36 ft. 9 in. (N.F. Mk. 21) 37 ft. 0 in.
Height 13 ft. 0 in. Wing area 361 sq. ft.

Weights and Performances:

	F. Mk. 20	N.F. Mk. 21	P.R. Mk. 22
Tare weight . . .	13,300 lb.	14,230 lb.	—
All-up weight . . .	18,530 lb.	19,530 lb.	18,230 lb.
Maximum speed* . .	467 m.p.h.	430 m.p.h.	467 m.p.h.
Initial climb . . .	4,000 ft./min.	4,400 ft./min.	4,650 ft./min.
Ceiling . . .	35,000 ft.	36,500 ft.	37,000 ft.
Range . . .	1,500 miles	1,500 miles	2,050 miles

* At 22,000 ft.

Production:

Mark	Serial range	Mark	Serial range
Prototypes F. Mk. 20 and N.F. Mk. 21 (mixed)	<i>PX212, PX214, PX219</i> <i>TT186-TT213,</i> <i>TT221, TT248</i> <i>VR836-VR893</i> <i>VZ707-VZ717</i> <i>WE235-WE247</i>	N.F. Mk. 21	<i>VV430-VV441</i> <i>VZ655-VZ664</i> <i>VZ671-VZ699</i>
		P.R. Mk. 22	<i>VW930-VW939</i> <i>VW946-VW978</i>

Service Use: (a) Sea Hornet F. Mk. 20: No. 801 Sqn. at Ford, Arbroath, Lee-on-Solent and aboard H.M.S. *Implacable* and *Indomitable*; No. 806 Sqn.; No. 809 Sqn.; No. 703 Trials Squadron; No. 728 and No. 771 Fleet Requirements Units
(b) Sea Hornet N.F. Mk. 21: No. 809 Sqn. at Culdrose, Malta, Leuchars and aboard H.M.S. *Vengeance*, *Indomitable* and *Eagle*; No. 728, No. 762, No. 771 and No. 787 Squadrons



D.H.104 Dove 1 *CC-CLW*, c/n 04273, of Linea Aerea Nacional, Chile.

De Havilland D.H.104 Dove

De Havilland's first postwar civil product was a twin Gipsy aircraft of modern concept, designed by R. E. Bishop's team as an interpretation of the Brabazon Committee's Type 5B to replace the Rapide. It was an all metal, low wing, cantilever monoplane with semi-monocoque fuselage, pneumatically retractable nosewheel undercarriage, and two D.H. Gipsy Queen 70 supercharged engines driving three bladed D.H. hydromatic feathering and reversible pitch airscrews. It was thus the first British transport fitted with braking airscrews. Built to Air Ministry Specification 26/43 and appropriately named the Dove, the prototype *G-AGPJ* was piloted by G. H. Pike on its first flight at Hatfield only six weeks after the defeat of Japan—on September 25, 1945—the 25th anniversary of the founding of the company. Development flying by the same pilot was followed by Farnborough trials which included a public demonstration on October 29th and then *'PJ'* returned to Hatfield to be fitted with an enlarged dorsal fin for improved control when flying on one engine. For aesthetic reasons the fin was remodelled later into the now familiar curve. In the following May the aircraft was handed over to the Ministry of Supply in whose service it had a long career as a development vehicle terminated with a tyre research programme by the Dunlop Rubber Co. Ltd. as *WJ310* at Baginton in 1952–53. Forerunner of over 500 production models, it flew later in Portuguese colonial service as *CR-CAC*.

Despite great superiority over the Rapide in cruising speed and single motor performance, the Dove's high purchase price and 50% greater operating costs were beyond most of the struggling charter firms of the period. Initial deliveries were therefore to airline operators—Airlines (Western Australia) Ltd. (2); Sudan Airways Ltd. (4); West African Airways Corporation (5); South African Airways (2); Eagle Airlines, Persia (3); S.A.T.A., Azores (2); Airways (India) Ltd. (4); Union of Burma Airways (4); six to patrol pipelines for the Iraq Petroleum



The prototype Dove at the end of 1945 with the first dorsal fin revision.

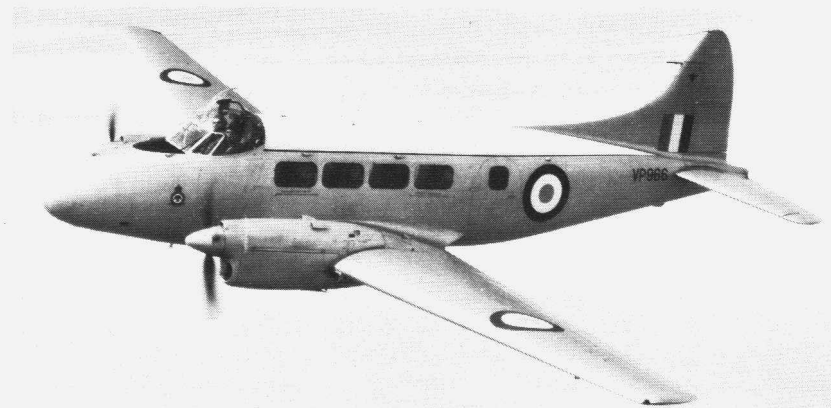
Transport Co. Ltd. and three to the Belgian airline SABENA for service in the Congo. A number were despatched to de Havilland Aircraft of Canada Ltd., including the first production aircraft *CF-BNU*, and the 15th, *CF-DJH*, which in 1947 became the sole example flown with a twin float undercarriage. Fourteen went into airline or business use in Canada and others were sent south to the U.S.A., Mexico and Venezuela.

Demand for the Dove was such that the assembly line was transferred to larger premises at Hawarden in 1951, the output from which made a valuable contribution to the export drive. Orders were executed for the



The float equipped Dove 1 *CF-DJH*, c/n 04015, flying over Toronto in 1947. (De Havilland Photo.)

Government of Brazil and for the national airlines of Iraq, Ethiopia and Chile. Argentina was the largest single Dove operator with a first batch of 20 and a second of 50 aircraft. United Kingdom operators included Skyways Ltd. whose "Sky Maid", *G-AHRB*, on December 9, 1949 was the first aircraft to land at Katmandu in the Himalayas while on charter to the United Kingdom High Commission. Other early Dove users were Hunting, Olley and Morton Air Services of Croydon; Cambrian Air Services Ltd., Cardiff; and B.O.A.C. which acquired three aircraft for crew training at Dorval, Filton and London. The Ministry of Transport and Civil Aviation Flying Unit employed a fleet of Doves specially equipped for calibrating airfield radio and for flight testing commercial licence candidates.



D.H.104 Devon C. Mk. 1 *VP966*, c/n 04218

Initially offered as a light transport with accommodation for 8 passengers, or as an 11 seater with reduced baggage space and no toilet, the Dove began a long association with the business world when the 6 seat Dove 2 executive version was introduced in 1948. The first Dove 2, Vickers-Armstrongs (Aircraft) Ltd.'s *G-AKSV*, demonstrated at the Farnborough S.B.A.C. Show in September of that year, foreshadowed purchases by the English Electric Co. Ltd., David Brown and Sons (Huddersfield) Ltd., Helliwells Ltd., Enfield Rolling Mills Ltd., Short Bros. and Harland Ltd., the Dunlop Rubber Co. Ltd., the Shell Refining and Marketing Co. Ltd., Ind Coope and Allsop Ltd. and Ferranti Ltd. Executive Doves were operated on strict airline schedules and found a ready market overseas, being used by such firms as Williamson Diamond Mines Ltd. in Tanganyika and the Anglo American Oil Co. Ltd. of South Africa. They served as personal aircraft of distinction, *CGG* with the Governor General of the Belgian Congo; *VT-CEH*, 'VA' and 'DBG' with the Maharajahs of Baroda, Bikaner and Jaipur; and *VT-COV* with the Governor of Assam.

Dove 3 was a projected high altitude survey model with oxygen and remote controlled vertical camera, and the 48th production airframe, completed to Specification C.13/46 as the prototype military communications version, was known as Dove 4. This had seating reduced to two crew and seven passengers by removing the front starboard seat to make way for a J Type dinghy. An initial batch of 30, *VP952-VP981* (cut back from 50), was supplied to the R.A.F. in 1948 under the designation Devon C. Mk. 1 and formed the equipment of No. 31 (Metropolitan Communications) Squadron, Hendon, and of Headquarters Communications Flights. In five instances R.A.F. Devons were stationed at foreign capitals such as Teheran and Buenos Aires under civil marks as Dove 4s for the temporary use of the Air Attachés. Devons were also supplied to the air forces of the Belgian Congo, Ceylon, Egypt, Eire, India, Iraq, the Lebanon, New Zealand, Pakistan and South Africa. In Sweden they were designated Tp46. Airline Doves were also transferred to military status in Ethiopia, Iraq and Jordan. A small number of Devons were employed by the R.A.E. and the Empire Test Pilots' School, Farnborough. In 1955 ten aircraft, *XJ319-324* and *XJ347-350*, the majority ex-civil, were delivered to the Fleet Air Arm under the designation Sea Devon C. Mk. 20 for operation by part of No. 781 Squadron at Lee-on-Solent as the Southern Communications Squadron. Three more were added in January 1956 for scheduled services to naval air stations and special flights abroad which earned them the Boyd Trophy for efficiency in 1959. When replaced by Sea Herons in May 1961 some were disposed of on the civil market.

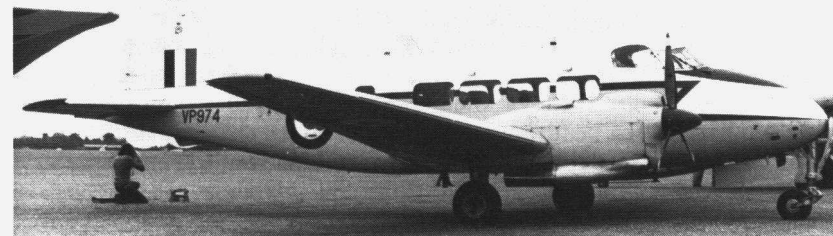
During the first 14 years of the Dove's production life, the only airframe modification of note was the fitting of an asymmetrical elevator to eliminate buffeting, major Dove variants resulting from the continued development of the Gipsy Queen series of engines. In its basic form with fuel injection and giving 330 h.p. at take off, this engine was known as the Gipsy Queen 70 and from 1948 was the standard power plant of the Dove 1 and 2 in developed form as the Gipsy Queen 70-3. From 1952 an improved model, the 340 h.p. Gipsy Queen 70-4 was available as an optional alternative amending the designation to Dove 1B and 2B respectively. Designations Dove 1A and 2A and all subsequent marks with suffix 'A', were reserved for custom-built models for the American market. In the following year, when the 380 h.p. Gipsy Queen 70 Mk. 2 was introduced to permit an increase in all-up weight to 8,800 lb., equivalent to a 20% increase in payload over a 500 mile stage, the corresponding designations became Dove 5 and 6. The single Dove 6B *G-AMRN*, c/n 04024, resulted from fitting these engines in an early production aircraft repatriated from South Africa.

Few Mk. 1 and 2 remained in service in the 1960s, the majority of existing Doves, and some Devons, having been fitted with uprated engines during overhaul. Secondhand Doves, often of considerable age, found a ready sale and like their illustrious forebear the Rapide, served in almost every country of the globe. Several Doves were ferried in British markings

half across the world to Japan Airlines, and in local markings to Shell in Venezuela; to the Iranian Oil and Exploration Co. Ltd. in Persia; to the Yugoslav national airline; the Swiss federal authorities; the Kuwait Government airline; to mining and textile interests in Italy, South Africa and French colonial Africa; and to Portuguese airlines in East Africa and Timor. The major user in Britain was East Anglian Flying Services Ltd., operating three of the four Dove 1Bs acquired from West African Airways Corporation in 1956-57 on high density tourist traffic between Southend and Jersey. Dove 1s erected at Bankstown by de Havilland Aircraft Pty. Ltd., served with Southern Airlines Ltd., a Dove 5 with the Royal Flying Doctor Service at Melbourne, two Dove 6s with the Australian Department of Health at Canberra and another with Bay of Plenty Airways Ltd. in New Zealand. A Dove 5, *G-APSO*, was used for experimental work and as a flying classroom by the College of Aeronautics at Cranfield, and in the same sphere, *G-AOSE* served as the development and demonstration vehicle for Smith's Para-Visual Director system. The single Dove 5X, *G-AJGT*, delivered as a Dove 1 to link the European factories of the Bata Shoe Co. Ltd. in July 1947, was later employed for engine and airscrew development by the de Havilland Engine Co. Ltd., Leavesden. Two Dove 1s in use by Fairey Air Surveys Ltd. had specially enlarged and bulged cockpit windows.



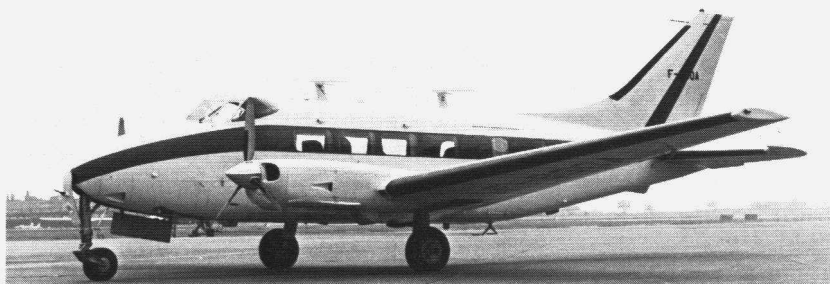
G-AJGT in 1964 with Gipsy Queen 70 Mk. 3 engines, in revised nacelles with thrust augmentor tubes, as the Dove 7XC during Dove 8 development. (John Goring Photo.)



Devon *VP974* after modification to Dove 8 standard with Heron cockpit canopy. (W. L. Lewis Photo.)



McAlpine Aviation's Riley Dove (first stage) conversion with two 400 h.p. Lycoming turbo-supercharged engines at Luton in 1971. (*Aviation Photo News.*)



Riley Dove (second stage) conversion *F-BGOA* with Lycomings and swept fin, supplied to Cie de Pont-à-Mousson at Nancy, France, in 1967. (*P. J. Bish Photo.*)

To satisfy a renewed interest in business flying in 1960, the Dove was remodelled in two versions. The Dove Custom 800, furnished to purchaser's requirements by Horton & Horton of Fort Worth, Texas, was for United States and South American markets which rapidly absorbed more than 100 Transatlantic air-delivered Doves for feeder line service or executive use by large commercial undertakings. The British equivalent, also a six seater and known as the Dove 8, was available with standard furnishings, improvement over older models resulting from the installation of two 400 h.p. Gipsy Queen 70 Mk. 3 engines. Earlier marks were indistinguishable externally but the Dove 8 was easily recognised by enlarged oil cooler intakes above the spinners and exhaust thrust augmentor tubes under the engines to reduce cooling drag and maintain a positive flow of air through the cowlings under all conditions. Five additional inches of headroom were provided for the crew by fitting a domed roof of the type used on the Heron, which resulted in deeper side windows to the cockpit which had the radio controls transferred to the roof and an improved one piece instrument panel. The prototype Dove 8 was *G-APYE*, first flown in February 1960, and the type was shown publicly for the first time when the appropriately lettered company demonstrator

G-ARDH appeared at the S.B.A.C. Show at Farnborough in the following September. The first Dove 8 delivery took place at Hatfield on January 24, 1961 when *G-ARJB* "Exporter" was handed over to J. C. Bamford (Excavators) Ltd. It then shared Tatenhill airfield, Burton-on-Trent, with the two Ind Coope executive Doves of earlier mark and their performance was such that if necessary, business representatives could put in eight hours work in a different European capital each day. An 8-11 passenger transport version of the Dove 8 was offered under the designation Dove 7, two of which were delivered to the Royal Malayan Air Force on September 6, 1961 and one to the United Arab Republic on the following day.

Production Dove 8s such as the National Coal Board's *G-ARUM*; British Insulated Callendar Cables' *G-ARYM*; and *G-ASYR* (which was ferried to Ethiopia and presented to the Emperor Haile Selassie as *IEAF.803* at Addis Ababa by H.M. The Queen on February 5, 1965) were typical of executive Doves the world over. The 542nd and final Dove, *G-AVHV*, delivered to Dowty Group Services Ltd. at Staverton on September 20, 1967 was tragically destroyed when it crashed into houses while landing at Wolverhampton on April 9, 1970. Components of the penultimate Dove, the Mk. 8 *G-AVVF*, were sent from Hawarden to Baginton for erection in 1967 and a production run of nearly 25 years ended when it was delivered to Martin-Baker Ltd. at Chalgrove in February 1968.

In 1965 eight R.A.F. Devons were re-engined to Dove 8 standard with the Gipsy Queen 175 by Hawker Siddeley and at M.U.s. Initially they retained the original Dove cockpit canopy, the raised Mk. 8 type being installed later when they were redesignated Devon C. Mk. 2.

Only limited success attended American efforts to modernise the Dove. The first type of conversion, intended for the executive market and offered by the Riley Aeronautics Corp. as the Riley Turbo Executive 400, featured two 400 h.p. Lycomings, better flight deck, restyled cabin and swept fin, the prototype, *N1472V*, being demonstrated in Britain in 1965. At least 17 were produced in the U.S.A., two of which, *F-BGOA* and *N477PM*, were based in Europe. Conversions undertaken in Britain by McAlpine Aviation Ltd. at Luton included *G-ARDH* for David Brown Industries Ltd.; *5N-AGF* for Bristow Helicopters Ltd., demonstrator *G-ASUW* and *F-BORJ* for Roger Beldon at Le Bourget. Only the last had the swept fin and in 1975 it returned to Biggin Hill for restoration as *G-ATGK* for Fairflight Charters Ltd. alongside *G-ASUW* which had been operating in Belgium with Sotramat as *OO-BPL* since 1967.

A more ambitious conversion for third level operators, the Carstedt CJ-600A Jet Liner, was first flown in the U.S.A. on December 18, 1966. An 87 inch fuselage stretch enabled 18 passengers to be carried on the power of two Garrett TEP-331 propeller-turbine engines. Four of these and two Riley Doves were used by Apache Airlines for commuter services radiating from Phoenix, Arizona. A similar CJ-600 conversion of the ex-Morton Air Services Dove 1B *G-AKJR*, begun by Channel Airways Ltd. at Southend, was abandoned at an early stage.

SPECIFICATION AND DATA

Manufacturers: The de Havilland Aircraft Co. Ltd., Hatfield Aerodrome, Herts. and
Hawarden Aerodrome, Chester

Power Plants: (Prototype) Two 330 h.p. de Havilland Gipsy Queen 70
(Dove 1 and 2) Two 330 h.p. de Havilland Gipsy Queen 70-3
(Dove 1B and 2B) Two 340 h.p. de Havilland Gipsy Queen 70-4
(Dove 5 and 6) Two 380 h.p. de Havilland Gipsy Queen 70 Mk. 2
(Dove 7 and 8) Two 400 h.p. de Havilland Gipsy Queen 70 Mk. 3
(Devon C. Mk. 1) Two 330 h.p. de Havilland Gipsy Queen 71
Two 340 h.p. de Havilland Gipsy Queen 70-4
(Devon C. Mk. 2) Two 400 h.p. de Havilland Gipsy Queen 175
(Sea Devon Mk. 20) Two 340 h.p. de Havilland Gipsy Queen 70-4
(Riley) Two 400 h.p. Lycoming IO-720-A1A

Dimensions: Span 57 ft. 0 in. Length 39 ft. 4 in.
Height 13 ft. 4 in. Wing area 335 sq. ft.

Weights and Performances:

	Dove 1 & 2	Dove 1B & 2B Devon and Sea Devon	Dove 5 & 6	Dove 7 & 8
Tare weight	5,650 lb.	5,650 lb.*	5,725 lb.	6,580 lb.
All-up weight	8,500 lb.	8,500 lb.	8,800 lb.**	8,950 lb.
Maximum speed	201 m.p.h.	210 m.p.h.	210 m.p.h.	235 m.p.h.
Cruising speed	165 m.p.h.	179 m.p.h.	179 m.p.h.	162 m.p.h.
Initial climb	850 ft./min.	750 ft./min.	920 ft./min.	1,420 ft./min.
Ceiling	20,000 ft.	20,000 ft.	20,000 ft.	21,700 ft.
Range	1,000 miles	1,000 miles	1,070 miles	1,175 miles

* Devon 5,780 lb.

** Dove 6B 8,500 lb.

Production:

Constructor's Numbers	Aircraft markings
04000/P.1-2 04001-04025	Prototypes G-AGPJ, 'UC CF-BNU, VH-AQO, G-AHRA, 'RJ, 'RB, VP-YES, 'ER, G-AHRI, ZS-BCB, G-AIIX, OO-AWD, VH-AQP, OO-AWE, 'CBM, CF-DJH, G-AIYY, VP-YET, G-AHYX, 'ICY, VP-YEU, ZS-AVZ, VT-CEH, G-AIWF, ZS-AVH, PP-RUC
04026-04050	G-AJBI, LV-XWH, G-AJDP, 'PR, CF-DJI, G-AJAA, YI-MYOB, G-AJLW, 'GT, LV-XWU, G-AJOS, 'HX, LV-XWI, 'WO, CF-DJO, G-AJJE, LV-XWL, G-AJHL, VR-NAB, LV-XWM, 'WN, 'WJ, VP952*, VR-NAG, ZK-AQV
04051-04075	G-AJOT, Iraq 270*, G-AJMA, 'ZU, VR-TAN, G-AKET, 'JNS, 'OU, 'ZT, EP-ACF-CH, G-AJLV, 'KJP, VT-COW, LV-XWP-WT, G-AKJG, YI-ABJ, VP954*, Indian HW201*, HW202*
04076-04100	Swedish 46001*, VT-CQA, HW203*, ZS-BCC, CGG, HW204*, VR-NAP, OO-CFD, G-AKJR, ZS-BVN, VP-YEV, ZS-BTM, VP959*, Iraq 265*, Egypt*, VH-AZY, VT-CKE, LV-XWV-WX, VR-NAY, YI-ABK, VR-NET, VT-CSO, Egypt*

* Devon C. Mk. 1.

Constructor's Numbers	Aircraft markings
04101-04125	VR-NEW, Egypt*, OO-CFE, VT-CQY, Iraq 266*, CS-TAB, 'AC, LV-XWY, 'WZ, 'XD, Argentine, Egypt*, YI-ABL, VR-NIB, LV-XZO, G-AKSK, VP-KDE-DG, 'EJ, G-AKSR, 'SS, Iraq 267*, Egypt Z904*, G-AKST
04126-04150	G-AKSU, VR-NIL, 'IT, Egypt Z905*, LV-XXE, Argentine, VP-YHU, Iraq 268*, VT-CTX, G-AKYS, LV-XZS-ZV, Pakistan P1300*, Iraq 269*, LV-XZW-ZZ, 'YAD, CR-ACI, 'CJ, LV-YAE, 'AF
04151-04175	VT-CTG, G-ALBF, LV-YAG, VP-YHV, LV-YAH, 'AI, CR-ACL, 'CM, Indian HW516*, HW517*, G-AKSV, HW525*, HW515*, HW518*, LV-YAJ, G-AKSW, VT-CVA, G-ALVF, NZ1802*, G-ALBM, HW526*, HW519*, VP953*, VR-NIX, XY-ABN
04176-04200	XY-ABO, HW520*, LV-YAL-AO, VP956*, XY-ABP, 'BQ, HW521*, HW522*, LV-YAP-AW, XY-ABR, 'BS, LV-YBN, 'BO, G-ALVS, LV-YBQ
04201-04225	VP955*, LV-YBR, 'AX, 'BS, VP981*, G-ALVT, VR-NOB, VP957*, VP958*, VP960-VP963*, LV-YBU, 'BG-BI, VP966*, VT-DBG, VP967-VP971*, LV-YAY
04226-04250	LV-YAZ, VP972*, VP974*, VP973*, LV-YBD-BF, G-ALFT, 'FU, S.A.A.F. 101*, G-ALTM, LV-YBJ, 'BL, 'BM, S.A.A.F. 102*, 103*, LV-YBP, S.A.A.F. 104*, Indian HW524*, HW523*, S.A.A.F. 105*, 106*, LV-YBT, HW527*, S.A.A.F. 107*
04251-04275	HW528*, Congo CGG (replacement), HW529*, HW530*, VP975*, S.A.A.F. 108*, VP964*, VP965*, VP976-VP980*, WB530*, S.A.A.F. 109*, WB531*, WB532*, CC-CLE, WB533-WB535*, CC-CLN, 'LW-LY
04276-04300	CC-CLZ, G-ALVD, CR-ADC, 'DD, CC-CAA, CF-GQH, CC-CAB- 'AF, WF984*, TJ-ACC, 'CD, G-AMKS, 'KT, 'DD, N4952N, NZ1803*, NZ1804*, G-AMEI, N80013, CF-GQQ, Lebanon LR-M-110*, G-AMHM
04301-04325	N4953N, N4261C, N4954N, LR-M-109*, N4955N, N4262C, N4956N, N4271C, N4957N, N4263C, N4959N, NZ1805*, F-BFVL, N4958N, N4264C, N4960N, N4270C, NZ1810*, NZ1806*, N4265C, NZ1811*, NZ1812*, NZ1807*, NZ1808*, N4980N
04326-04350	N4962N, CF-GYR, G-AMKA, 'KB, N4979N, G-AMKC, N4964N, '65N, PT-AMP, CF-GYQ, G-AMKD, N4267C, F-OAKG, N4966N, '67N, N4268C, N4968N, N4269C, F-BGOA, CF-GCU, N4969N, '70N, N4274C, N1516V, N4971N
04351-04375	N4272C, N4972N, N4273C, N1517V, '36V, CF-GBE, N4276C, '75C, '77C, N1558V, '38V, '39V, '41V, '42V, '71V, N4278C, Belgian Congo D.14*, Eire 176*, N1572V, '73V, '64V, '74V, CR-AGT, XA879*, G-AMVT
04376-04400	N4279C, CF-GBV, N1575V, G-AMXR, N1576V, XB-SUC, YV-TFTQ, N1578V, '79V, CF-GBW, G-AMUZ, CF-EYL, G-AMWZ, N1559V, CF-EYM, G-AMXN, G-AMXT/XJ347**, G-AMXU, 'VR, YV-O-CVF2, NZ1813-NZ1816*, G-AMXV
04401-04425	G-AMXW/XJ349**, XB-SUU, NZ1817-NZ1819*, G-AMXX/ XJ348**, G-AMWY, 'YM, G-AMXY/XJ323**, G-AMXZ/XJ324**, NZ1820-NZ1822*, G-AMXO, XB-TAN/XJ321**, XB-TEZ, NZ1823- NZ1825*, G-AMXP/XJ319**, G-AMYP/XJ322**, G-ANAI, YU-ABO, NZ1826*, NZ1827*
04426-04450	NZ1828-NZ1830*, G-AMZJ, 'ZK, 'ZY, YU-ABN, G-ANAP, VP-RCV, G-ANDX/XG496*, XA880*, G-AMZN, G-ANBP, 'BR, 'CO, G-ANDY/XJ320**, Belgian Congo D.15*, D.16*, G-ANFD, 'OV, 'GU, D.17*, G-ANJB, 'JC, 'PH

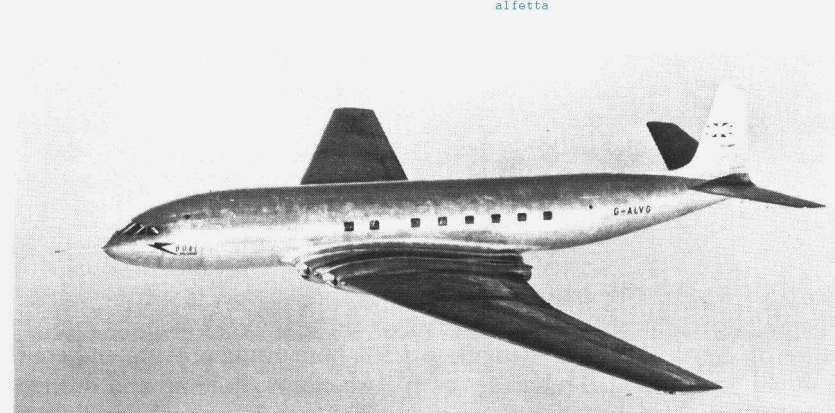
* Devon C. Mk. 1.

** Sea Devon C. Mk. 20.

Constructor's Numbers	Aircraft markings
04451-04475	<i>G-ANTO, OY-FAL, XJ350**</i> , <i>G-ANUT</i> , 'UU, <i>YV-P-AEQ, G-AOAG, G-ANUW, ZS-MTD, G-AODM, 'DV, HB-LAS, Ceylon CS401*, CS402*, YV-P-AEO, I-SNAM, YV-P-BAP, G-AORM, I-TONY, G-AOSE, 'TE, XK895-XK897**</i> , <i>G-AOUA</i>
04476-04500	<i>G-AOUF, 'FI, 'UG, 'UH, PH-IOA, 'OG, G-AOZF, PH-IOH, 'OL- 'ON, G-APBA, OE-VBM, CS403*, G-APBG, OY-ADG, YV-P-AEA, PH-ILI, 'OB, I-ANIC, HB-LAP, CS404*, XM223*, VH-DHH, export</i>
04501-04526	<i>CS405*, CS406*, Eire 188*, G-APSK, 'SO, Belgian Congo D.21*, D.22*, VH-DHK, G-APVX, PH-FST, G-APZU, G-ARHW, 'HX, 'MT, G-APYE, G-ARBD, 'BE, 'JB, 'DH, 'EA, Malaya FM1051-FM1053, Arab 906, G-ARSN, 'SI</i>

* Devon C. Mk. 1.

** Sea Devon C. Mk. 20.



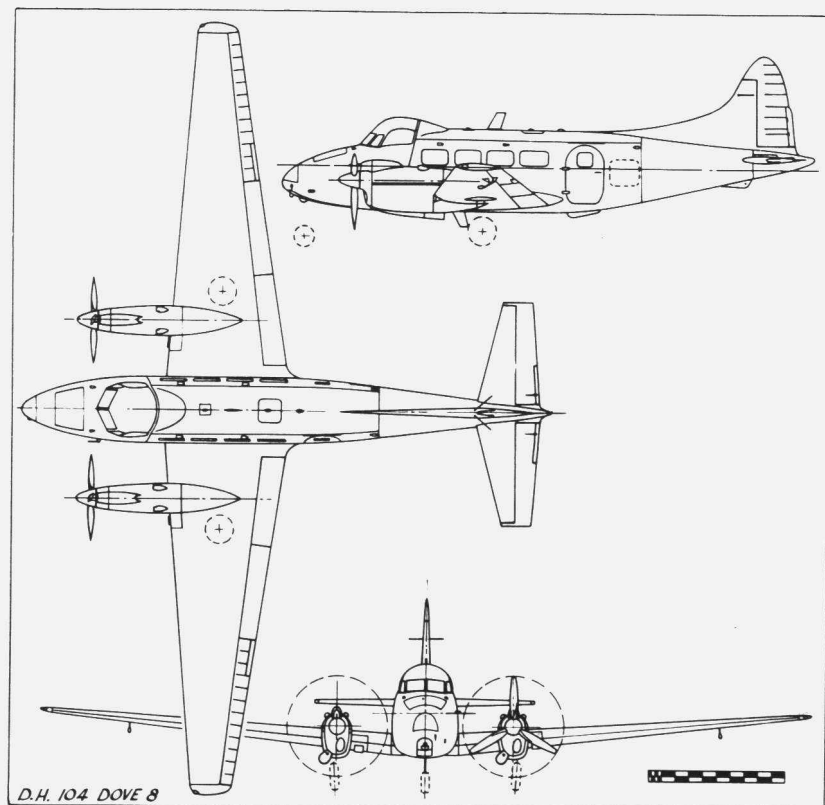
The first prototype D.H.106 Comet *G-ALVG*, c/n 06001. (De Havilland Photo.)

De Havilland D.H.106 Comet

Realising that a complete breakaway from the piston engine was the only sure way of wresting the wartime lead in transport aircraft from the Americans, a team led by R. E. Bishop made several design investigations to meet the Brabazon Committee's Type 4 specification. During 1944 several unorthodox configurations were considered, one with twin booms and three Goblin turbojets, a rear engined canard with Ghosts and a tailless type with swept wing and short fuselage. Experience with the D.H.108 tailless research aircraft resulted however in the new D.H.106 transport being finalised on more orthodox lines. The name Comet was revived and construction took place at Hatfield in considerable secrecy.

Piloted by John Cunningham with a crew of three, *G-5-I/G-ALVG*, first of two prototypes ordered by the Ministry of Supply to Specification 22/46, flew for the first time at Hatfield on July 27, 1949. It was an all metal 36 seater with a circular section fuselage mounted on a thin, moderately swept wing with four de Havilland Ghost 50 turbojet engines buried in the root ends. Attention was paid to handling characteristics at each end of the speed range by providing unusually generous flaps and employing Lockheed Servodyne hydraulically assisted power controls. Four crew occupied a flight deck in the nose, the all-weather visibility from which had been carefully determined by means of flight trials with a repeatedly modified Airspeed Horsa towed by a Halifax. The tricycle undercarriage was equipped with large single main wheels which retracted outward into bulges in the under surface of the mainplane.

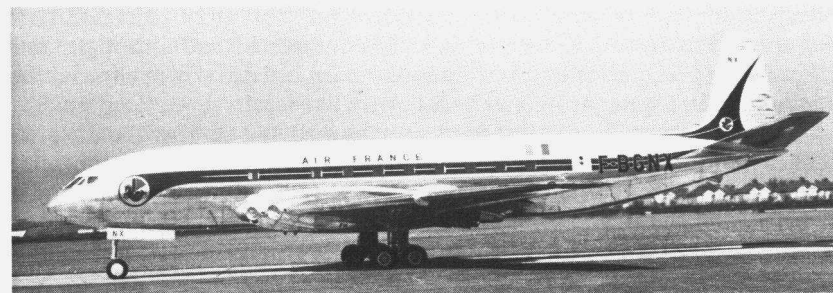
Public demonstration at Farnborough in September 1949 was followed by a number of fast overseas flights to measure fuel consumption under simulated airline conditions commencing with a return trip to Castel Benito, Libya at an average speed of 448 m.p.h. by John Cunningham on October 25, 1949. A 5½ hour endurance test was made round Britain,



followed on February 21, 1950 by the first flight with the cabin pressurised to maintain cabin altitude at 8,000 ft. when cruising at 40,000 ft. Some 324 hours flying was completed in 11 months of relatively trouble free trials which included out and home inter-capital records early in 1950 between London and Rome, Copenhagen and Cairo at average speeds above 420 m.p.h. The Cairo record was established on April 24, 1950 while carrying 11 technicians to tropical trials at Khartoum and Nairobi.

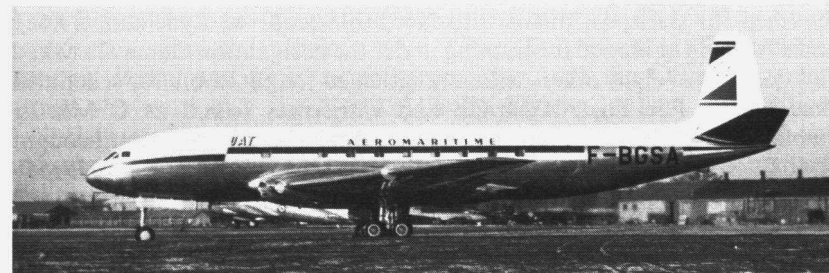
The second Ministry of Supply Comet, *G-5-2/G-ALZK*, flown at Hatfield by John Cunningham and Peter Buggé on the anniversary of the first flight of the prototype, was delivered to the B.O.A.C. Comet Unit at Hurn on April 2, 1951 to inaugurate a 500 hour route proving and crew training programme. Techniques of fuel economy, holding and descent were then evolved during twelve proving flights to Johannesburg, Beirut, Delhi, Singapore and Djakarta. A production line was then established at Hatfield for the construction of ten Comet 1s which were delivered to B.O.A.C. in quick succession commencing with *G-ALYP* on April 8, 1952 and ending with 'YZ' on September 23rd. Small multi-wheel bogie undercarriage units which lay flush with the under surface of the mainplane when retracted were standard on all production Comets. B.O.A.C. began simulated passenger schedules to Johannesburg with freight in January 1952 and the world's first pure jet flight with fare paying passengers was made to that city by *G-ALYP* on May 2, 1952. A regular day-and-a-half scheduled service over the 10,200 mile route between London and Tokyo was inaugurated on April 3, 1953 and operating at 89% load factors, the Comet 1s proceeded to cut flying times by half and to eclipse all contemporary schedules and block speeds. The Comet reached a peak of fame and popularity when Queen Elizabeth the Queen Mother, Princess Margaret, Sir Geoffrey and Lady de Havilland made a Royal request flight round Europe on May 23, 1952, and in the following year *G-ALYW* carried the same Royal passengers to the Rhodes Centenary celebrations at Salisbury, Southern Rhodesia.

The static exhibition of *CF-CUM*, first of two Comet 1As for Canadian Pacific Airlines, at Farnborough in September 1952 heralded ten overseas sales. Equipped as 44 seaters and operating at a higher all-up weight of 110,000 lb. the Comet 1As were powered by Ghost 50 Mk. 2 engines using water-methanol injection and were equipped with extra bag tanks in the outer wings to increase total fuel capacity to 7,000 gallons for, in this instance, the long stage between Honolulu and Sydney. 5301, first of two similar aircraft ordered by the Royal Canadian Air Force to equip No. 412 Transport Squadron, became the first jet transport to cross the Atlantic during delivery to Ottawa via Keflavik and Gander on May 29, 1953. Three others, *F-BGSA*-*'SC*, were delivered to Union Aéromaritime de Transport, the first of which made the initial proving flight from Paris to Dakar via Casablanca on December 27, 1952. Three further Comet 1As, *F-BGNX*-*'NZ* were acquired by Air France whose first Paris-Rome-Beirut turbojet service was flown by 'NY' on August 26, 1953.



Air France Comet 1A *F-BGNX*, c/n 06020, showing the bogie-type undercarriage fitted to production aircraft. (De Havilland Photo.)

CF-CUN "Empress of Hawaii", second of the Canadian Pacific Comets, had been involved in a take off disaster at Karachi on March 3, 1953 while en route to Sydney to commence the company's first trans-Pacific service to Vancouver. Its sister aircraft was then disposed of to B.O.A.C. and converted to Comet 1 as a replacement for *G-ALYZ*, damaged beyond repair when taking off from Rome on October 26, 1952. These accidents showed that if the nose were held too high on take off, the aircraft would not reach flying speed and Comets were then fitted with drooped leading edges. These setbacks were the first of a series which were widely publicised and painstakingly investigated. *G-ALYV* was destroyed with the loss of 43 lives while climbing westbound out of Calcutta on May 2, 1953; 'YP' plunged into the sea from a height of 26,000 ft. near Elba with a loss of 35 lives just after take off from Rome on January 10, 1954; and 'YY' crashed off Stromboli with 21 passengers, also after take off from Rome on April 8th of the same year. All Comets in British, Canadian and French ownership were then grounded but an expert examination of unprecedented magnitude failed to reveal any mechanical or structural defect. Instrumented flight trials with the former Canadian Pacific Comet *G-ANAV* coupled with severe ground fatigue testing of *G-ALYR* and 'YS' and water tank pressure testing of *G-ALYU* at Farnborough, were used in conjunction with a microscopic examination of the salvaged wreck of 'YP'.



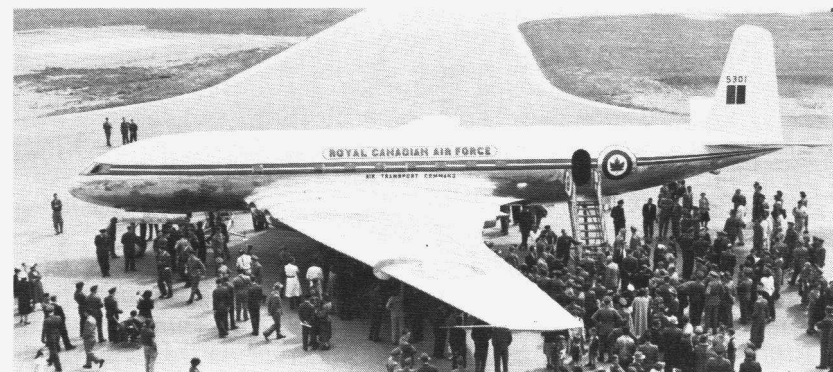
F-BGSA, first Comet 1A for Union Aéromaritime de Transport, ready for delivery from Hatfield in 1952.

which accurately pinpointed the failure of one corner of the rear ADF window. Twenty-two Comet 1s had been completed and although their career was at an end, valuable lessons had been learned which ensured the success of the Comet 4s in later years.

The first prototype Comet, used as a testbed for de Havilland Sprite rocket motors, made its first assisted take off on May 7, 1951 and after performing at the 1952 S.B.A.C. Show was handed over to the R.A.E. for structural testing. Attention was then directed towards the development of a Transatlantic Comet with more power and more fuel. This was the Comet 2 with a 3 ft. fuselage extension, tankage increased to 7,000 gallons and fitted with Avon 502 axial flow jet engines. The trial Avon installation was made to the Comet 1 *G-ALYT* during manufacture and thus engined the aircraft first flew at Hatfield as the Comet 2X on February 16, 1952. On the completion of tropical trials with this aircraft in May of the following year, an order was placed for twelve 44 seat Comet 2s for the B.O.A.C. service to South America. The first of these, *G-AMXA*, first flown on August 27, 1953, was shown at the S.B.A.C. Show in the following month and concluded flight trials with a convincing demonstration of long range characteristics when John Cunningham covered the 3,064 miles from Hatfield to Khartoum nonstop in 6½ hours on January 22, 1954. As a result of the Comet 1 investigation all Comet 2 fuselage pressure shells were rebuilt at Chester in heavier gauge metal with rounded openings, and the engine jet pipes were 'swept out' to reduce fuselage buffeting. R.C.A.F. Comet 1As were also rebuilt to this standard at de Havilland's Chester factory and returned to service as Comet 1XBs on September 26, 1957. Two surviving Air France Comet 1As, acquired by the Ministry of Supply in 1954, were similarly modified for experimental use at the R.A.E. in 1958. Several overseas orders were received for the Comet 2 and additional production facilities were established at the Chester works and at Short Bros. and Harland Ltd.'s Belfast factory but trials showed that although the range was now adequate for the South Atlantic it was still not sufficient for nonstop operation over the northern route. As modification was only possible at the expense of increased tare weight, only 18 Comet 2s were completed and only 15 of these actually flew. A few were fitted with Avon 118s for initial use by the R.A.F. on unspecified duties. Eventually all were modified for transport duties with No. 216 Squadron, Lyneham, *XK669* and *670* being equipped for training under the designation Comet T. Mk. 2 and delivery of eight others with strengthened freight doors for scheduled runs to the Far East, Australia and Christmas Island as C. Mk. 2s, commenced on June 7, 1956. The two training aircraft were later brought up to C. Mk. 2 standard and three additional ex-civil Comet 2s *XK655*, *659* and *663* were modified for signals duties by Marshalls at Cambridge and served with Nos. 192 and 51 Squadrons. The first Comet produced at Chester was also the last C. Mk. 2 *XK716*. After continuous test flying which ended with de-icing tests with an Avon 524 in the starboard outer position, the original Comet 2X *G-ALYT* made a last 12 minute flight on

May 28, 1959 to Halton where John Cunningham landed on the 3,800 ft. grass strip and handed it over to No. 1 School of Technical Training as an instructional airframe. It was scrapped in September 1967.

The Comet 2 was succeeded by *G-ANLO*, a single example of a stretched version known as the Comet 3 with Avon 502 engines, large pinion tanks at two-thirds span and maximum accommodation increased to 78. It was flown for the first time by Messrs. Cunningham and Buggé on July 19, 1954 and in the course of a long development programme, the same crew left Hatfield on December 2, 1955 and flew round the world via Australia, New Zealand, Fiji, Vancouver and Dorval, arriving home on the 28th. The Comet 3 averaged 501 m.p.h. to lower the Perth–Sydney record to 4 hours 6 minutes and was the first jet airliner to cross the Pacific and the first to circumnavigate the globe. It was later re-engined and first flew with Rolls-Royce Avon 523s on February 25, 1957.



Welcoming party for the first Royal Canadian Air Force Comet 1A at Rockcliffe, June 1953.

The Comet 4, proposed in 1955 with Avon 524s and still greater fuel capacity, at last satisfied B.O.A.C.'s North Atlantic requirements and 19 aircraft *G-APDA*–'DT' were ordered in 1957 and the first flew at Hatfield on April 27, 1958. Route proving trials were conducted with two special aircraft *G-AMXD* and 'YK' with Avon 524s in the outboard nacelles and Avon 504s in the inner under the designation Comet 2E. To build up Avon experience, simulated services were flown throughout 1957 between London, Beirut and Calcutta and from May 1958 the Comet 2Es also turned westward over the North Atlantic. During its final certification trials they were joined by the first Comet 4 *G-APDA*, which, between dawn and sunset on September 14th of that year, was flown by John Cunningham and crew 7,925 miles from Hong Kong to London in a flying time of 16 hours 16 minutes. Three days later the same aircraft lowered the London–Gander record to 5 hours 47 minutes and on successive days made Montreal–Vancouver–Mexico City–Lima–Buenos Aires nonstop flights. The world's first Transatlantic jet flights with fare paying passengers were



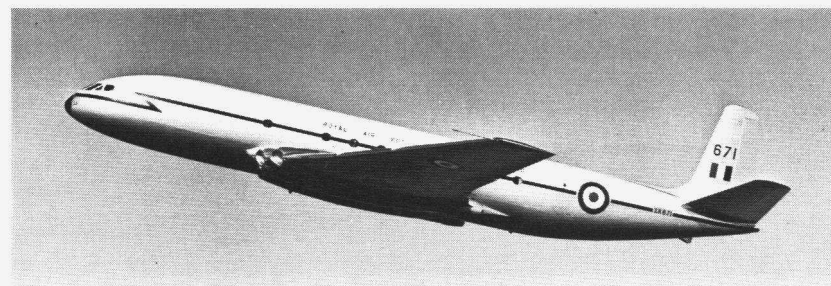
Comet 2X G-ALYT, c/n 06006, showing the enlarged intakes of the Avon 502 engines. (De Havilland Photo.)

made simultaneously on October 4th by G-APDC (Capt. R. E. Millichap) westbound and 'DB (Capt. T. B. Stoney) eastbound. Comets took over all London–New York 'Monarch' flights in the following month and during 1959 were placed on the Ceylon, Australia, Tokyo and Johannesburg routes. In 1960 Comet services were opened to the Caribbean, Chile, Canada and Persia and in their first two years of operation the 19 B.O.A.C. Comet 4s flew 27,000,000 miles, carried 327,000 passengers in a total flying time of 68,500 hours.

First fruit of demonstrations in Latin America was an order from Aerolineas Argentinas for six Comet 4s with which jet operations commenced over the Andes between Buenos Aires and Santiago on April 16, 1959. Services across the South Atlantic to Europe started on May 19th and the New York service was opened shortly afterwards. The last three Argentine Comets were fitted with thrust reversers.

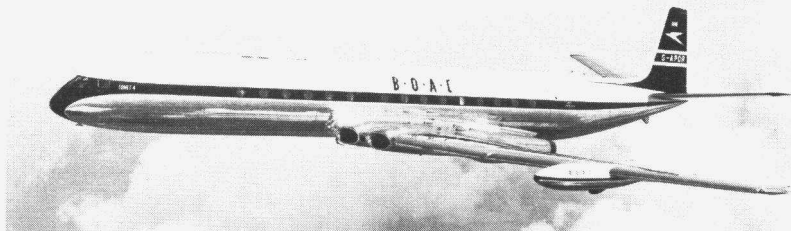
In July 1956 American interest had crystallised into an order from Capital Airlines for four long distance Comet 4s and ten special Comet 4As to operate short and medium stage lengths at a reduced cruising altitude of 23,500 ft. They were to have 40 in. fuselage extensions, accommodate up to 92 tourist passengers and have wing span reduced by 7 ft. to permit higher cruising speeds at the lower altitude. These orders were cancelled for financial reasons but in April 1958 British European Airways Corporation ordered a similar shorthaul version to suit its own requirements as the Comet 4B. This version was stretched 38 in. to accommodate a maximum of 99 passengers, the span was reduced and the pinion tanks deleted. To expedite their going into service, a flight test programme was conducted with the Comet 3 G-ANLO which, with shortened wing span and thrust reversers, flew under the designation Comet 3B on August 21, 1958. It was then demonstrated in B.E.A.C. livery as "R.M.A. William Brooks" at Farnborough in the following month. The first B.E.A.C. Comet 4B G-APMA commenced certification trials in June 1959 and deliveries commenced in the following November. On July 19th 'MA covered the

Northolt–Le Bourget stage of the *Daily Mail* London–Paris air race in 27 minutes. The first scheduled services were operated on April 1, 1960, 'MB between Tel Aviv and London; 'MD in the reverse direction; 'MA to Nice and 'MF on the inaugural service to Moscow. Within two months the fleet was achieving a daily average utilisation of 7½ hours and by mid 1961 the Comet 4B fleet had increased to 15 aircraft. Early in 1960 four Comet 4Bs equipped to carry 22 first class and 64 economy class passengers, were delivered to Olympic Airways, Athens, who in consortium with B.E.A.C. linked Athens with Istanbul, Tel Aviv, Nicosia, Beirut, Cairo, London and the chief European capitals.



Transport Command Comet C. Mk. 2 XK671 "Aquila", c/n 06029. (De Havilland Photo.)

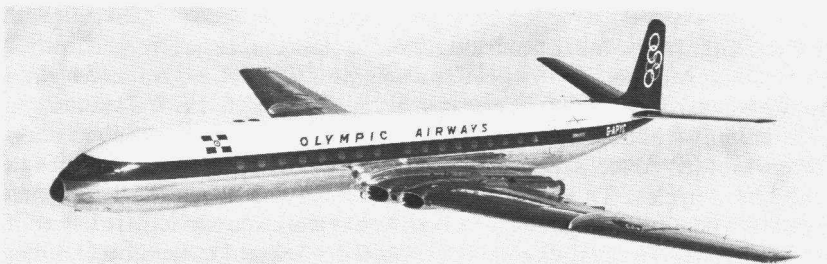
Resulting from the astonishing field performance of the Comet 4 G-APDA at Mexico City Airport at a height of 7,340 ft. above sea level, in hot weather from an 8,200 ft. runway, on September 20, 1958, a specialised version known as the Comet 4C was ordered by Cia. Mexicana de Aviacion for its 'Golden Aztec' services linking Mexico City with Havana, Chicago and Los Angeles. This was a compromise having the same wing, fuel capacity and all-up weight of the Comet 4 but the large capacity fuselage of the Comet 4B. The first Comet 4C, G-AOVU, flew at Hatfield on October 31, 1959 piloted by W. P. I. Fillingham and by May 1960 orders had been received for 50 Comet 4s, 4Bs and 4Cs. In addition to the Hatfield- and Chester-built specimens already mentioned, three Comet 4s were delivered to the East African Airways Corporation; seven Comet 4Cs to United Arab Airlines for services from Cairo to Beirut and London; and four others to Middle East Airlines for routes radiating from Beirut to Europe and India. Guest Aerovias also operated two Comet 4Cs on lease from Mexicana. In September 1960 an increase in all-up weight to 160,000 lb. was authorised for Comet 4s and 4Cs which from that time onwards were fitted with the 4B stub wing which eliminated the tare weight penalty and so increased the range to 3,225 miles. During the 1961 S.B.A.C. Show, orders were received for a Comet 4C for the personal use of King Ibn Saud of Saudi Arabia and for five Comet C. Mk. 4s for Transport Command R.A.F. Equipped with 94 backward facing seats, but easily convertible for ambulance duties to carry 12 stretchers, 47 sitting cases and 6 sick berth



Production Comet 4 *G-APDR*, c/n 6418, for B.O.A.C. with standard fuselage and long range wing. (De Havilland Photo.)



VP-KPJ, first Comet 4 for East African Airways Corporation.



Production Comet 4B *G-APYC*, c/n 6437, for Olympic Airways with stretched fuselage and standard wing. (De Havilland Photo.)



Production Comet 4C *SU-ALE*, c/n 6434, for United Arab Airlines with stretched fuselage and long range wing. (De Havilland Photo.)

attendants, the first Comet C. Mk. 4 *XR395* made its maiden Chester-Hatfield flight on November 15, 1961.

As a contribution to future developments in commercial aviation and to make ready for the entry into service of the D.H.121 Trident and the Vickers VC10, Comet 3B *G-ANLO*, now *XP915*, joined the R.A.E., Bedford on June 21, 1961 for use by the Blind Landing Experimental Unit and the aerodynamics department. Comet 2E *G-AMXK* was also used at Hatfield by Smiths Aircraft Instruments Ltd. for development work on their own automatic landing scheme. On November 18, 1966 it was delivered to the R.A.E., Bedford, for further trials as *XV144*.

The last Comet service out of Heathrow, flown by Sudan Airways on November 11, 1972, heralded the eclipse of the type as a major transport. Hawker Siddeley Dynamics' test bed *XM823*, once *G-APAS*, flew to Colerne in May 1973 for preservation and the No. 51 Squadron C. Mk. 2s became instructional airframes at St. Athan, Halton, Cosford and Topcliffe. *XK697*, once *G-AMXJ*, went to the Wyton Air Scouts as a clubroom and *XK695*, the former *G-AMXC*, flew to Ringway on May 13, 1974 to be dismantled and re-erected near the Manchester Ship Canal as a café. Comet 3 *XP915/G-ANLO* (non-flying) was used at the R.A.E., Bedford, for runway foam arresting tests early in 1973 but on August 22nd was despatched by road to Woodford as an additional Nimrod trial installation airframe.

To increase its spares backing, Dan-Air Services Ltd. acquired East African Comet 4s *5H-AAF*, *5X-AAO* and *5Y-AAA* which were flown from Nairobi and dismantled at Lasham in 1971. Aerolineas Argentina's *LV-AHN* and 'HS met the same fate after their arrival in December that year, followed by Middle East Airlines' Comet 4C *OD-ADT*, ferried via Gatwick on October 3, 1973. Mexicana's Comet 4 *XA-NAP*, once *XA-NAZ/G-APDR*, flew back to Stansted via Goose Bay on June 25, 1971 as spares for Channel Airways Ltd. and went to the Fire school when the company ceased operations in 1972. Channel's ex-Greek Comet 4Bs, *G-APYD* and 'ZM', were sold to Dan-Air which acquired others from B.E.A. Airtours.

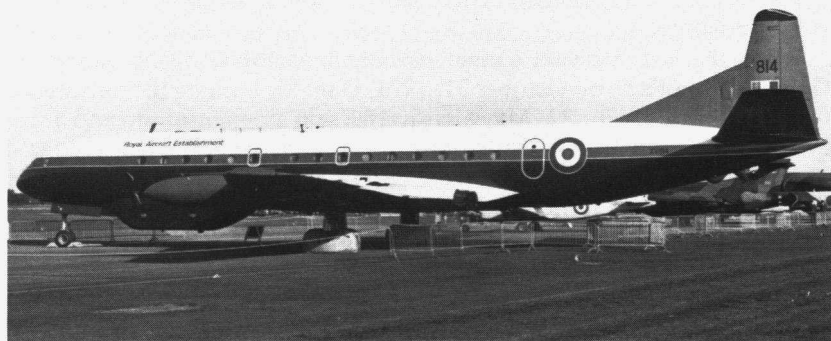
When the last Airtours Comet service, flown by *G-ARJL*, landed at Gatwick from Paris on October 31, 1973, Dan-Air became the only major Comet operator with 11 Mk. 4Bs in 109 seat configuration and three Mk. 4Cs. Their Mk. 4s were withdrawn progressively, the last Comet 4 service being flown Newcastle-Alicante-Teesside by *G-APDB* on November 13, 1973. It was ferried to Duxford for preservation on February 12, 1974 and during its final flight made a farewell flypast at Hatfield where it had first left the ground 15½ years previously.

G-APDF joined the R.A.E. as *XV814* in 1970; *G-APDP*, partially modified by Dan-Air at Lasham as an airborne early warning test bed for the R.A.E., was delivered to Bedford in June 1973 as *XX944*; *G-APDC* became an engine test stand and *G-APDM* a cabin staff trainer at Gatwick, a role it was still fulfilling more than ten years later.



Dan-Air Comet C.4 *G-BDIW* taxiing out from Gatwick on 9.11.80 at the start of this type's last commercial service, a local commemorative flight (Mike Axe photo.)

After a round of defence cuts in 1975, the five Comet C. Mk. 4s of No. 216 Squadron, *XR395* to *XR399*, were delivered Leconfield-Lasham for Dan-Air and put into commercial use as Comet 4Cs *G-BDIT* to '*IX*' respectively. Further to implement its policy of flying Comets as a long-term operation, the company also bought up Sudan Airways' Comet 4Cs *ST-AAW* (which had been in long-term storage at Teesside) and *ST-AAX*; as well as the former Egyptair 4Cs *SU-ALM*, '*MV*' and '*NC*'. These were re-registered as *G-ASDZ*, *G-BDIF*, *G-BEEX*, '*EY*' and '*EZ*' respectively 1975-76, but all except '*IF*' were quickly scrapped. Dan-Air Comets continued to ply the airways of Europe until the survivors were finally retired at the end of the 1980 season. The last Comet to carry fare paying passengers was *G-BDIW* which flew a special "farewell to the Comet" flight from Gatwick on November 9, 1980. It is now on show at Düsseldorf Airport, having been flown there on February 7, 1981. Of the others still serviceable in 1980, *G-BDIT* flew to Blackbushe on June 8, 1981, but was scrapped in 1984; *G-BDIU* was ferried to British Aerospace, Bitteswell, on July 9, 1981, where the airframe was used to assist in the A.E.W. Nimrod pro-

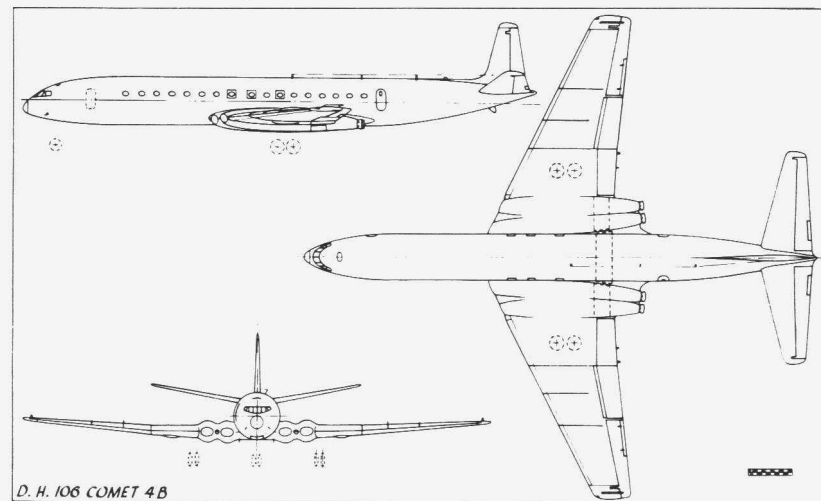


The Royal Aircraft Establishment's extensively modified Comet 4 *XV814* was formerly *G-APDF* with B.O.A.C.

gramme; and *G-BDIX* was delivered to the Royal Scottish Museum at East Fortune on September 30, 1981. Others of the fleet to escape the scrap merchant's axe were *G-APDB* flown to Duxford for preservation on February 12, 1974 and *G-APYD* ferried to join the Science Museum's Transport Collection at Wroughton on November 1, 1979.

Overseas, the former R.C.A.F. Comet *IXB N373S* and the AREA Comet 4 *HC-ALT*, once *G-APDI*, were derelict at Miami in September 1973, while the former Mexicana Comet 4Cs *XA-NAR*, '*AS*' and '*AT*', were acquired by Westernair Inc. and flown to Albuquerque, New Mexico, in May 1973 as *N888WA*, *N999WA* and *N777WA*. However, by 1979 all three were derelict, at Everett (Washington State), Chicago and Mexico City respectively.

Only the A.&A.E.E.'s Comet 4C *XS235* "Canopus" and the R.A.E.'s *XV814* were still flying in 1987.



SPECIFICATION AND DATA

Manufacturers: The de Havilland Aircraft Co. Ltd., Hatfield Aerodrome, Herts. and Hawarden Aerodrome, Chester

Power Plants:	(Comet 1)	Four 4,450 lb. s.t. de Havilland Ghost 50 Mk. 1
	(Comet 1A)	Four 5,000 lb. s.t. de Havilland Ghost 50 Mk. 2
	(Comet 1XB)	Four 5,500 lb. s.t. de Havilland Ghost 50 Mk. 4
	(Comet 2)	Four 7,300 lb. s.t. Rolls-Royce Avon 503
		Four 7,300 lb. s.t. Rolls-Royce Avon 118
	(Comet 2E)	Two 7,330 lb. s.t. Rolls-Royce Avon 504 and two 10,500 lb. s.t. Rolls-Royce Avon 524
	(Comet 2X)	Four 6,600 lb. s.t. Rolls-Royce Avon 502
	(Comet C. Mk. 2)	Four 7,300 lb. s.t. Rolls-Royce Avon 117
	(Comet 3)	Four 10,000 lb. s.t. Rolls-Royce Avon 502
		Four 10,000 lb. s.t. Rolls-Royce Avon 523
	(Comet 4 and 4B)	Four 10,500 lb. s.t. Rolls-Royce Avon 524
	(Comet 4C)	Four 10,500 lb. s.t. Rolls-Royce Avon 525B
	(Comet C. Mk. 4)	Four 10,500 lb. s.t. Rolls-Royce Avon 350

Dimensions, Weights and Performances:

	Comet 1	Comet 1A	Comet 2	Comet 3
Span	115 ft. 0 in.	115 ft. 0 in.	115 ft. 0 in.	115 ft. 0 in.
Length	93 ft. 0 in.	93 ft. 0 in.	96 ft. 0 in.	111 ft. 6 in.
Height	28 ft. 4 in.	28 ft. 4 in.	28 ft. 4 in.	28 ft. 6 in.
Wing area	2,015 sq. ft.	2,015 sq. ft.	2,015 sq. ft.	2,121 sq. ft.
All-up weight	107,000 lb.*	115,000 lb.**	120,000 lb.***	145,000 lb.
Cruising speed	490 m.p.h.	475 m.p.h.	490 m.p.h.	500 m.p.h.
Cruising altitude	35,000 ft.	40,000 ft.	40,000 ft.	40,000 ft.
Maximum stage with capacity payload	1,750 miles	1,750 miles	2,100 miles	2,500 miles
Passengers	36-44	36-44	36-44	58-78

Lower figure represents first class, higher represents alternative tourist seating.

* *G-ALVG* 102,000 lb., *G-ALZK* 105,000 lb.

** Comet 1XB 117,000 lb.

*** Comet 2X 108,000 lb.

	Comet 4	Comet 4A	Comet 4B	Comet 4C
Span	114 ft. 10 in.	107 ft. 10 in.	107 ft. 10 in.	114 ft. 10 in.
Length	111 ft. 6 in.	114 ft. 10 in.	118 ft. 0 in.	118 ft. 0 in.
Height	28 ft. 6 in.	28 ft. 5 in.	28 ft. 6 in.	28 ft. 6 in.
Wing area	2,121 sq. ft.	2,059 sq. ft.	2,059 sq. ft.	2,121 sq. ft.
All-up weight	160,000 lb.	152,500 lb.	157,960 lb.	162,000 lb.
Cruising speed	503 m.p.h.	522 m.p.h.	532 m.p.h.	503 m.p.h.
Cruising altitude	42,000 ft.	23,500 ft.	23,500 ft.	39,000 ft.
Maximum stage with capacity payload	3,225 miles	2,730 miles	2,500 miles	2,650 miles
Passengers	60-81	70-92	72-101	72-101

Lower figure represents first class, higher represents alternative tourist seating.

Production:

Constructor's Numbers	Mark	Built	Aircraft markings
06001-06002	Prototypes	Hatfield	<i>G-ALVG</i> , 'ZK
06003-06005	1	"	<i>G-ALYP</i> -Y S
06006	2X	"	<i>G-ALYT</i>
06007-06012	1	"	<i>G-ALYU</i> -Y Z
06013-06022	1A	"	<i>CF-CUM</i> "Empress of Vancouver", 'UN "Empress of Hawaii", <i>F-BGSA</i> , 'SB, R.C.A.F. 5301, '02, <i>F-BGSC</i> , 'NX'-NZ <i>G-AMXA</i> -XK, XK698, XK699, test airframe, XK715, unfinished (3)
06023-06040	2	"	XK716, unfinished (4)
06045-06049	2	Chester	<i>G-ANLO</i>
06100	3	Hatfield	

(*G-ALYP* crashed off Elba 10.1.54; 'YV' crashed near Calcutta 2.5.53; 'YY' crashed off Stromboli 8.4.54; 'YZ' damaged beyond repair at Rome 26.10.52; *CF-CUM* sold to B.O.A.C. as *G-ANAV*; 'UN' crashed at Karachi 3.3.53; *F-BGSC* damaged beyond repair at Dakar 25.6.53; *F-BGNX*-NZ returned to Ministry of Supply as *G-AOJT*, 'JU' and *G-APAS*; 5301, '02 and *G-AOJU* to Mk. 1XB)

Constructor's Numbers	Mark	Built	Aircraft markings
6401-6405	4	Hatfield	<i>G-APDA</i> , test airframe, <i>G-APDB</i> -DD
6406, 09, 12	4	Chester	<i>G-APDE</i> , 'DH', 'DK
6407-6408	4	Hatfield	<i>G-APDF</i> , <i>LV-PLM/LV-AHN</i> "Las Tres Marias"
6410-6411	4	"	<i>LV-PLN/LV-AHO</i> "Lucero de la Tarde", <i>LV-PLP/LV-AHP</i> "El Lucero del Alba"
6413, 15	4	"	<i>G-APDL</i> , 'DN
6414, 16, 17	4	Chester	<i>G-APDM</i> , 'DO', 'DP
6418-6420	4	"	<i>G-APDR</i> -DT
6421-6423	4B	Hatfield	<i>G-APMA</i> "Sir Edmund Halley", 'MB "Walter Gale", 'MC "Andrew Crommelin"
6424-6425	4C	"	<i>G-AOVU/XA-NAR</i> , <i>G-AOVV/XA-NAS</i>
6426	4B	"	<i>G-APMF</i> "William Finlay"
6427-6429	4	Chester	<i>G-APDG</i> , 'DI', 'DJ
6430	4	Hatfield	<i>LV-POY/LV-AHR</i> "Alborada"
6431-6434	4	Chester	<i>VP-KPJ</i> , <i>LV-POZ/LV-AHS</i> "Las Tres Marias", <i>VP-KPK</i> , <i>LV-PPA/LV-AHU</i> "Centaurus"
6435-6438	4B	Hatfield	<i>G-APMD</i> "William Denning", 'ME "John Tebbutt", <i>G-APYC/SX-DAK</i> , <i>G-APYD/SX-DAL</i> "Queen Olga"
6439, 41, 44	4C	Chester	<i>SU-ALC</i> -LE
6440, 42, 43	4B	Hatfield	<i>G-APZM/SX-DAM</i> "Queen Sophia", <i>G-APMG</i> , <i>G-ARBB/XA-NAT</i>
6445	4C	"	<i>OD-ADR</i>
6446, 48, 50	4C	Chester	<i>OD-ADQ</i> , 'DS', 'DT
6447, 49, 51	4B	Hatfield	<i>G-ARDI</i> "Princess Sophia", 'CO', 'CP
6452, 56	4B	Chester	<i>G-ARJK</i> , 'JM
6553, 55, 57	4B	Hatfield	<i>G-ARGM</i> , 'JL
6454, 58, 60	4C	Chester	<i>SU-ALL</i> , 'LM, <i>G-AROV</i>
6467-6471	C. Mk. 4	Chester	<i>XR395</i> -XR399
6472-6475	4C	Hatfield	<i>VP-KRL</i> , <i>XS235</i> , <i>9K-ACE</i> , <i>SU-ANI</i>

(*LV-AHN* damaged beyond repair near Asuncion, Paraguay 26.8.59; *LV-AHO* burned out at Buenos Aires Airport 20.2.60; *LV-AHR* crashed and burned on take off from Campinas Airport, Brazil 23.11.61)

Service Use: (To be read in conjunction with previous tables)

- With 'C' Flight, No. 192 Squadron, Wyton (renamed No. 51 Squadron 21.8.58) for signals duties—c/n 06023, 25 and 27 as XK655, XK659 and XK663.
- With No. 216 Squadron, Transport Command,* Lyneham—c/n 06024, 28-32, 34, 35, 37 and 45 as XK669 "Taurus", XK670 "Corvus", XK671 "Aquila", XK695 "Perseus", XK696 "Orion", XK697 "Cygnus", XK698 "Pegasus", XK699 "Sagittarius", XK715 "Columba", XK716 "Cepheus". (*Later Air Support Command and No. 46 Group.)
- For experimental use—c/n 06006 to No. 1 S. of T.T., Halton as 7610M; c/n 06021 to Boscombe Down for Decca/Dectra trials as XM829; c/n 06022 for Firestreak tests by de Havilland Propellers Ltd. at Hatfield as XM823; c/n 06026 to R.A.E., Farnborough, for long range radio aid development as XN453; c/n 06100 to B.L.E.U., Bedford as XP915; c/n 6417 to R.A.E., Bedford as XX944 for airborne early warning research.



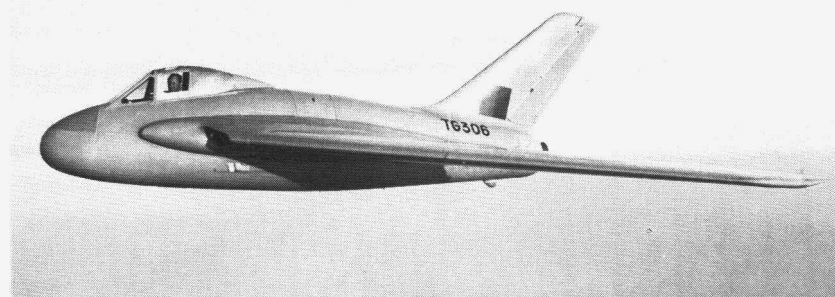
TG283, the first prototype D.H.108, at Hatfield on May 30, 1946. (*Associated Press Photo.*)

De Havilland D.H.108

The D.H.108 was a single seat research aircraft without horizontal tail surfaces built to investigate the behaviour of swept wings and to provide basic data for the D.H.106 Comet jet transport and the D.H.110 fighter. Design work began in October 1945 and three prototypes were built to Specification E.18/45 using standard fuselages taken from the Vampire production line at the English Electric Co.'s works at Preston. The new wing was attached to the existing pick-up points and was of all metal construction with a moderate sweep back of 43 degrees but was 15% greater in area than that of the Vampire. Control was obtained by using a conventional rudder in conjunction with elevons which combined the duties of elevator and ailerons and were fitted outboard of the split trailing edge flaps.

The first prototype, TG283, was completed in the spring of 1946 and although the Under Secretary of the Ministry of Supply referred to it as the Swallow, it was not the maker's practice to bestow names on research aeroplanes, and the D.H.108 was no exception. After completion at Hatfield, TG283 was taken by road to Woodbridge, Suffolk where on May 15, 1946 Geoffrey de Havilland Jnr. made a few preliminary hops on the 3,500 yard R.A.F. emergency runway and afterwards made a normal take off and uneventful first flight of 30 minutes duration. The R.A.E., Farnborough had warned the de Havilland design team led by Mr. R. E. Bishop of the possibility of dutch rolling or dropping a wing with complete loss of control at low speeds in aircraft of this configuration. As a precautionary measure therefore the D.H.108 was fitted with generous Handley Page slots fixed in the open position, and anti-spin parachutes in cylindrical containers at each wingtip. In practice none of

these snags materialised and the pilot not only succeeded in flying slowly enough to formate on a Dove and to pose alongside a Proctor for air to air photography, but later flew to Hatfield to indulge in dog fights with a Mosquito.



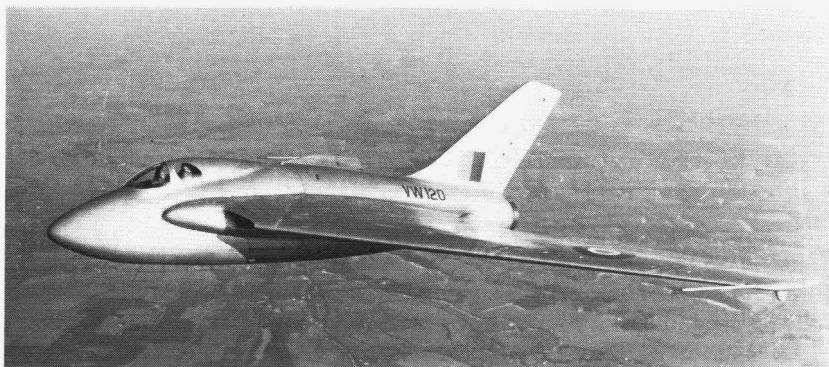
TG306, the second prototype D.H.108, showing the modified cockpit canopy. (*'Flight' Photo 19602S.*)

Commencing September 16, 1948 TG283 made several test flights with dihedral on the wing but this was soon removed and when full trials were complete and the aerodynamic characteristics of the swept wing had been fully investigated, the aircraft was transferred to the R.A.E., Farnborough in October 1948. Here it continued stability, control and landing trials which led to the fitting of a long stroke Sea Vampire undercarriage. Landings at higher angles of attack without risk of striking the tail pipe on the runway were made in February 1950 at a much reduced touch-down speed of 95 knots. The career of this aeroplane ended in a crash at Hartley Wintney, Hants., during stalling trials on May 1, 1950, the pilot, S/Ldr. G. E. C. Genders, A.F.C., D.F.M., being killed.

Whereas the first had been a subsonic aircraft built solely for the purpose of solving swept wing control problems, the second prototype TG306 was a much modified and potentially supersonic version built to assess the high speed characteristics of such a wing. It was therefore fitted with Handley Page automatic slots which could be locked by the pilot, powered flying controls of the type to be fitted to the Comet and sweep back increased to 45 degrees. The mainplane was again attached to a standard Vampire fuselage but during construction the airframe was fitted with all the necessary cables and pipe lines for the installation of full automatic recording instrumentation. A boosted engine known as the Goblin 3 was installed and the aircraft flew for the first time at Hatfield on August 23, 1946 and quickly attained true level speeds above the 616 m.p.h. of the World's absolute speed record. Geoffrey de Havilland gave a polished display of aerobatics in this aircraft at the Radlett S.B.A.C. Show of September 12-13th after which it was groomed for an attempt on the record over the official course near Tangmere. He left Hatfield on September 27th

with the intention of making a high speed practice flight low down over the Thames Estuary after a dive from 10,000 ft. Twenty minutes later eye witnesses saw the aircraft break into several large pieces and fall into Egypt Bay, N.E. of Gravesend, Kent. Nearly all the wreckage was recovered, including the engine which examination showed not to have been at fault, and the subsequent enquiry established that the structure had failed under the very great loads experienced at air speeds in the region of Mach 0.9.

Trials with *TG306* had shown that a much improved performance would be obtained if the pilot's seat were lowered, the canopy redesigned and an elongated and more pointed nose fitted. After trials with a revised nose of this kind on Vampire *TG281*, a third and final D.H.108 was similarly



VW120, the third prototype D.H.108, showing the modified nose section and improved cockpit streamlining. (De Havilland Photo.)

equipped and fitted with an even more powerful Goblin 4. Numbered *VW120* it first flew at Hatfield on July 24, 1947 piloted by John Cunningham who succeeded Geoffrey de Havilland as chief test pilot and continued the research flying until, a year later, enough data had been compiled for the aircraft to be spared for an attempt on the 100 km. International Closed-circuit speed record. Entered jointly by the manufacturers and the owners, the Ministry of Supply, and piloted by John Derry, *VW120* lapped the special pentagonal course near Hatfield on the evening of April 12, 1948 to set up a new record speed of 605.23 m.p.h. The same aircraft and pilot exceeded the speed of sound in Britain for the first time on September 9th in a 41 minutes flight during which Derry climbed on oxygen to 40,000 ft. and exceeded Mach 1 in a dive to 30,000 ft. Two days later he gave an awe inspiring demonstration of aerobatics at the Farnborough S.B.A.C. Show and on August 1, 1949 took *VW120* to Elmdon for the S.B.A.C. Challenge Trophy Race in which it had been entered by Sir Geoffrey de Havilland. In poor weather conditions he lapped the short course at 488 m.p.h. but was unable to overtake either John Cunningham's Vampire 3 *VV190* or T. S. Wade's Hawker P.1040 *VP401*.

Soon afterwards the aircraft was handed over to the Ministry of Supply

and went to the R.A.E., Farnborough where it joined the original slow speed prototype. Its career ended on February 15, 1950 in a crash near Birkhill, Bucks., killing the pilot Sq. Ldr. J. S. R. Muller-Rowland D.S.O., D.F.C., due, it was said, to a failure of the pilot's oxygen supply.

SPECIFICATION AND DATA

Manufacturers: The de Havilland Aircraft Co. Ltd., Hatfield Aerodrome, Herts.

Power Plants: (1st prototype) One 3,000 lb. s.t. de Havilland Goblin 2
(2nd prototype) One 3,300 lb. s.t. de Havilland Goblin 3
(3rd prototype) One 3,750 lb. s.t. de Havilland Goblin 4

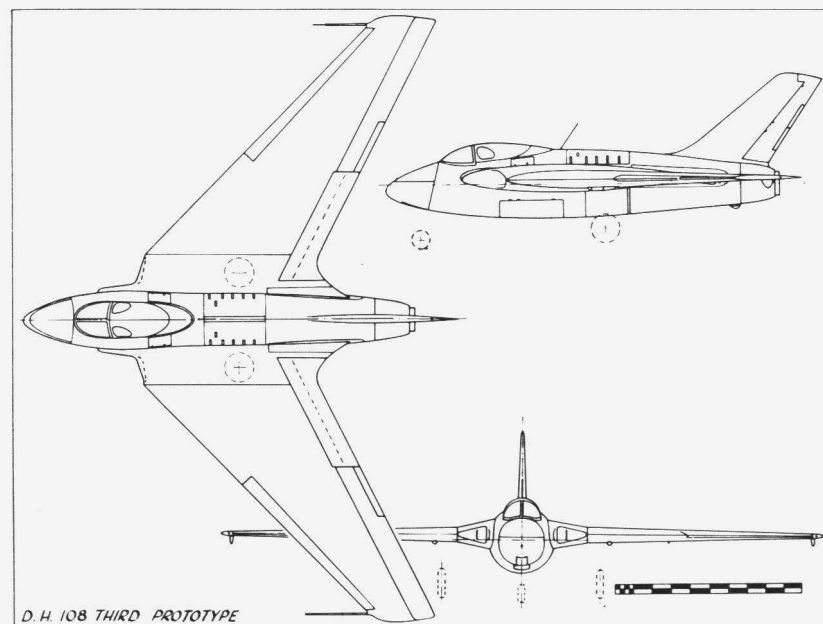
Dimensions: Span 39 ft. 0 in.
Length (1st prototype) 25 ft. 10 in. (2nd prototype) 24 ft. 6 in.
(3rd prototype) 26 ft. 9½ in.
Wing area 328 sq. ft.

Weight: All-up weight (1st prototype) 8,800 lb. (2nd prototype) 8,960 lb.

Performance: Maximum speed (1st prototype) 280 m.p.h.
(2nd prototype) 640 m.p.h.

Production:

Prototype	Serial	First flight	Remarks
1	<i>TG283</i>	15. 5.46	To R.A.E., Farnborough 10.48, crashed near Hartley Wintney, Hants. 1.5.50
2	<i>TG306</i>	23. 8.46	Crashed at Egypt Bay, Kent 27.9.46
3	<i>VW120</i>	24. 7.47	To R.A.E., Farnborough 11.49, crashed at Birkhill, Bucks. 15.2.50



D. H. 108 THIRD PROTOTYPE



Production Sea Vixen F.A.W. Mk. 1 XJ525, of No. 890 Sqn., showing the pylon mounted overload fuel tanks and D.H. Firestreak guided missiles. ('Flight' Photo 41178.)

De Havilland D.H.110 Sea Vixen

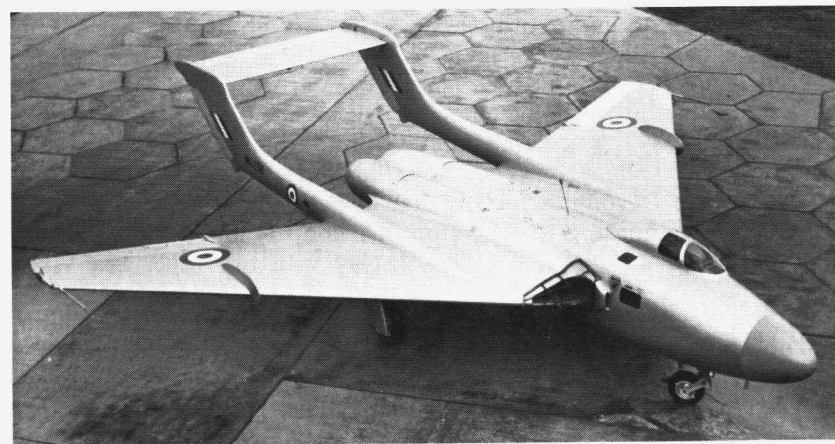
First proposed in 1946 as a later generation naval all-weather fighter, the D.H.110 design was the final and largest development of the Vampire-Venom theme. It was also amended to meet an advanced R.A.F. night fighter requirement but detail design and construction did not commence until 1948 when the Air Ministry issued a Specification for an R.A.F. transonic, two seat, all-weather fighter similar to the D.H.110 design and ordered two prototypes. These were built at Hatfield under the direction of J. P. Smith.

The D.H.110 was an all metal, stressed skin, twin boom monoplane with the swept wing which had been aerodynamically proven on the D.H.108. It was equipped with powered controls incorporating 'q feel', armed with four 30 mm. Aden guns and powered by two Rolls-Royce Avon engines side by side in the rear of the fuselage nacelle. The pilot's cockpit was offset to port to provide sufficient working space for a radar operator below and behind on the starboard side. Radar equipment included a hydraulically driven scanner in a fibre-glass radome in the nose. The first prototype, WG236, flew for 46 minutes at Hatfield on September 26, 1951 piloted by John Cunningham and first exceeded the speed of

sound in a shallow dive on April 9, 1952. The second prototype, WG240, flew on July 25th of that year but on September 6th John Derry and his flight test observer Tony Richards were killed when WG236 broke up during demonstrations at the S.B.A.C. Show. WG240 did not fly again until June 11, 1954 after modifications which included an all moving tailplane, cambered leading edge extensions outboard of the wing fences and reduced ventral fin area. The R.A.F. passed the D.H.110 over in favour of the Gloster Javelin but the Royal Navy decided to shelve Sea Venom modernisation—the D.H.116 project—in favour of the larger twin engined D.H.110, re-worked to sea-going standards. This involved an 80% redesign at Christchurch under the direction of W. A. Tamblin and included the provision of arrester hooks, hydraulic nosewheel steering (tested at Hatfield on Vampire 5 VV217), power folding wings and long stroke undercarriage. The Aden guns were removed.

An order was placed by the Ministry of Supply in February 1955 for three pre-production development aircraft and a contract signed for an initial, but substantial, Admiralty production batch. A further substantial contract was awarded in June 1959 followed by a repeat order on August 25, 1960. The first Ministry of Supply aircraft, the intermediate, fixed wing, semi-navalised prototype XF828, designated Sea Vixen Mk. 20X, flew at Christchurch piloted by Lt. Cdr. J. Elliot on June 20, 1955. The same pilot had already made touch-and-go landings on H.M.S. *Albion* in the second prototype WG240 fitted with long travel oleos on September 23, 1954 and the first arrested deck landing by XF828 was made on H.M.S. *Ark Royal* on April 5, 1956. In 1961, WG240 was still in use at R.N.A.S. Arbroath as an instructional airframe.

Production Sea Vixen F.A.W.1s were erected at Christchurch using undercarriage units built by de Havilland Propellers Ltd., radomes made at Hatfield and stub and extension wings sub-contracted by Folland



WG236, the first prototype D.H.110. (De Havilland Photo.)

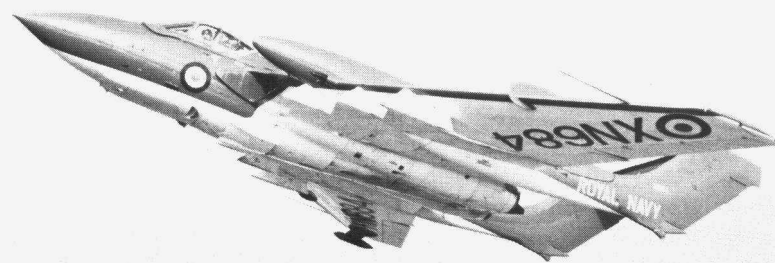


Sea Vixen F.A.W. Mk. 1 XJ488 fitted with Flight Refuelling's Mk. 20 "Buddy System" refuelling pod. (Flight Refuelling Ltd. Photo.)

Aircraft Ltd., Hamble and de Havilland's Portsmouth factory. They were the heaviest aircraft ever to enter British naval service and had performance and armament equal to any contemporary land based fighter. They were also the first British interceptors to dispense with guns and in the all-weather fighter role were equipped with Ferranti pilot attack sight and armed with four de Havilland Firestreak infra-red homing missiles and twenty-eight 2 in. air-to-air rockets stowed in two retractable fuselage containers. For alternative strike/reconnaissance duties the Firestreaks were interchangeable with four 500 lb. or two 1,000 lb. pylon-mounted bombs, or alternatively clusters of six 3 in. air-to-surface rockets, packs of 124 two-inch air-to-air rockets or drop tanks. XJ474, the first production Sea Vixen F.A.W.1 flew at Christchurch on March 20, 1957 and together with XJ475 took part in trials at Boscombe Down, the R.A.E., Bedford and at sea in H.M.S. *Ark Royal*. They also made 166 deck landings on H.M.S. *Centaur*.

In November 1957 No. 700 Squadron, 'Y' Flight, of the Service Trials Unit began a working up programme with early production Sea Vixens which included three weeks in H.M.S. *Victorious* during which three aircraft made 172 deck arrested landings, 23 at night. On July 2, 1959, after more than a decade of intensive development, the first Sea Vixen squadron, No. 892, was formed at Yeovilton around the crews and aircraft of No. 700 Squadron. They embarked in H.M.S. *Ark Royal* during a voyage from Devonport to Gibraltar in February 1960, and returned the 1,000 miles nonstop to Yeovilton in 1 hour 54 minutes on June 18, 1960 to attend the Naval Air Day display with two other Sea Vixen squadrons, Nos. 766 and 890, the latter from H.M.S. *Hermes*.

All Sea Venom squadrons, including Nos. 893 and 899 at Yeovilton, had now been re-equipped with Sea Vixens and a further development was the manufacture by Flight Refuelling Ltd. of the Mk. 20 underwing drogue type refuelling pack to enable a tanker Sea Vixen to refuel another by the "Buddy System". Trials were made at Hatfield by test pilots Chris Capper and Peter Barlow, and in May 1961 a Sea Vixen remained airborne



Sea Vixen F.A.W.2 conversion, XN684, showing the boom extensions ahead of the wing for housing extra fuel.

8 hrs. 2 mins. by this method. Australia had also shown an interest in the type and two crated examples were despatched by s.s. *Ballerat* in June 1960 to the R.A.A.F. base at Edinburgh near Adelaide.

Production of the Sea Vixen F.A.W. Mk. 1, ended in 1963 at XP918, the 119th aircraft. It was superseded by the F.A.W. Mk. 2 which, in addition to the retractable rocket packs, carried four Red Top infra-red homing missiles on pylons under the wings or, alternatively, four Bullpup air-to-surface missiles for ground strafing. They were recognised by the deepened tail booms extending forward of the wing to house additional fuel.

Twenty-nine Sea Vixen F.A.W. Mk. 2s were built and the first entered service in July 1964 with No. 899 Squadron, the Initial Training Unit for the type. The squadron sailed for the Far East in H.M.S. *Eagle* in December that year and during the Aden withdrawal in 1967 one of its Sea Vixens, carrying the British flag, was the last aircraft to leave. It re-embarked with 14 Sea Vixen F.A.W. Mk. 2s in October 1970 but was disbanded in February 1972.

Main training was provided by the Naval Air Fighter School, Yeovilton, formerly No. 766 Squadron whose aerobatic team "Fred's Five" had enlivened flying displays in F.A.W. Mk. 1s in 1963. Its first F.A.W. Mk. 2, XS582, arrived on July 7, 1965 and two months later it received XJ580, first of a number of the earlier mark converted to F.A.W. Mk. 2 standard.

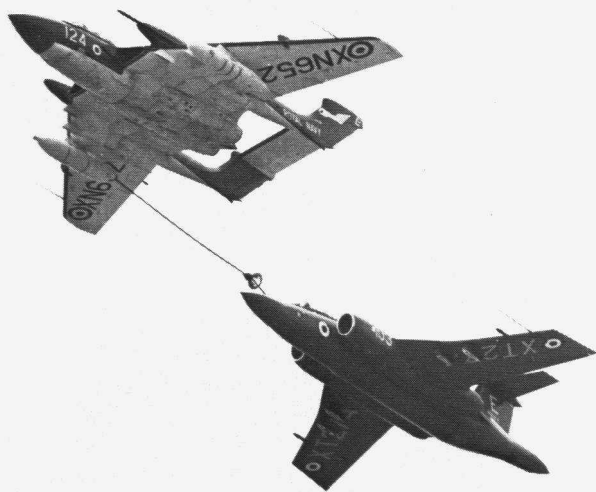
In the flying tanker role Sea Vixens F.A.W. Mk. 2s of No. 892 Squadron, flown off H.M.S. *Hermes* off Cyprus in 1967, refuelled B.A.C. Lightning F. Mk. 3 fighters of No. 56 Squadron during local defence exercises. Six of No. 892's F.A.W. Mk. 2s, known as "Simon's Circus", also provided the Navy's aerobatics at the Farnborough S.B.A.C. Show in September 1968.

Twelve Sea Vixen F.A.W. Mk. 2 aircraft of No. 893 Squadron, detached from R.N.A.S. Yeovilton for 10 days to take part in the 1968 Cyprus defence exercises, flew nonstop to R.A.F. Akrotiri with refuelling from R.A.F. Victor tankers en route. The distance, 2,200 miles, was the longest range achieved by the Sea Vixen or by a whole squadron of naval aircraft.

XJ481, last surviving Sea Vixen F.A.W. Mk. 1, which had been on the strength of the A.&A.E.E. at Boscombe Down for many years alongside

the F.A.W. Mk. 2 *XP919*, was transferred to the Fleet Air Arm Museum, Yeovilton, in 1974. In 1985 it was moved, on loan, to a new theme park at Ilkeston, Derbyshire.

Some of No. 890 Squadron's aircraft were in use by Airwork Ltd., operators of the F.R.U. at Yeovilton from 1971 until the survivors were transferred to join other examples of the type operated by Flight Refuelling Ltd. in 1974. The same firm were responsible for the development of a pilotless drone version of the Sea Vixen designated D.3, three examples of which, *XN657*, *XS577* and *XS587* are thought to have been tested at R.A.E. Llanbedr, before the programme was cancelled. These machines together with the other survivors, used as target tugs, were withdrawn from use in 1984. One, *XS587*, was sold to Brencham Ltd., operators of a collection of airworthy historic jet fighters, and registered *G-VIXN* on August 5, 1985. However, before it could be restored to flying condition the death of the firm's owner, Mike Carlton, resulted in its sale to the Manchester Vulcan Bomber Society in 1986. Another, *XJ580*, is preserved by the Sea Vixen Society at Christchurch, near the site of the former airfield and de Havilland factory.



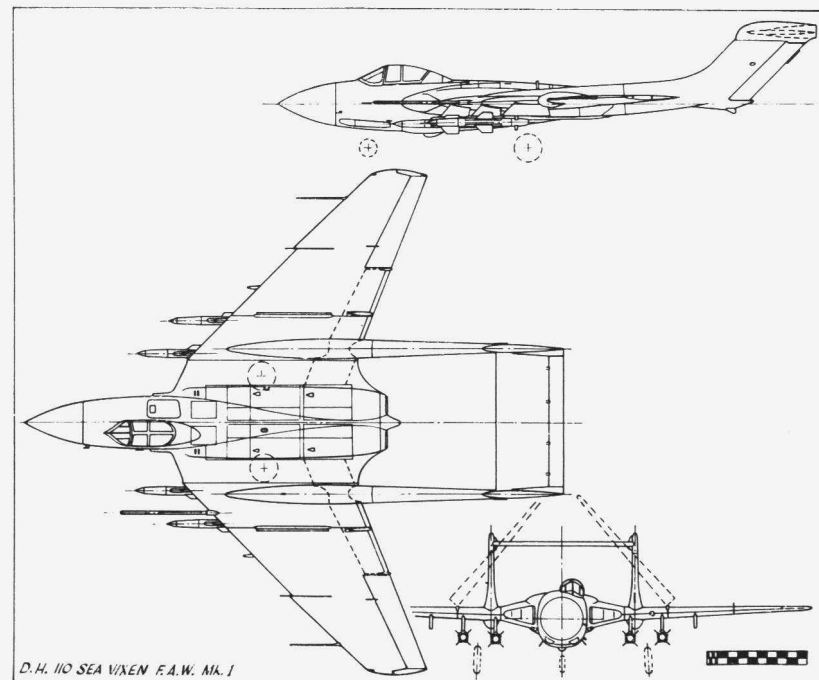
Sea Vixen F.A.W.2, *XN652*, of No. 899 Squadron, refuelling a Royal Navy Blackburn Buccaneer S.2 at the Biggin Hill Air Fair, May 1965. (*Aviation Photo News*.)

SPECIFICATION AND DATA

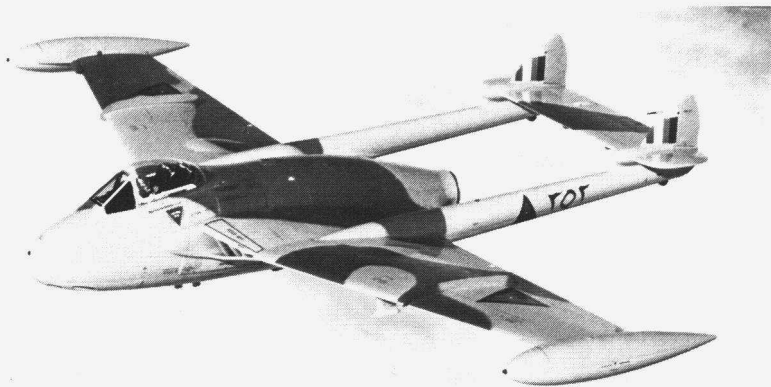
Manufacturers: The de Havilland Aircraft Co. Ltd., Hatfield Aerodrome, Herts. and Christchurch Aerodrome, Hants.

Power Plants: (D.H.110) Two Rolls-Royce Avon
(Sea Vixen F.A.W.1 and F.A.W.2) Two 10,000 lb. s.t. Rolls-Royce Avon 208

<i>Dimensions:</i>	(D.H.110)	Span 50 ft. 0 in.	Length 52 ft. 1½ in.
		Height 10 ft. 9 in.	Wing area 648 sq. ft.
	(Sea Vixen F.A.W.1 and F.A.W.2)	Span 50 ft. 0 in.	Length 55 ft. 7 in.
		Height 10 ft. 9 in.	Wing area 648 sq. ft.
<i>Weights:</i>	All-up weight (F.A.W.1) 35,000 lb. (F.A.W.2) 37,000 lb.		
<i>Performance:</i>	(Sea Vixen F.A.W.1)	Maximum speed at 10,000 ft. 645 m.p.h.	
		Time to 40,000 ft. approximately 6½ minutes	
		Service ceiling 48,000 ft.	
	(Sea Vixen F.A.W.2)	Maximum speed at 10,000 ft. 640 m.p.h.	
		Time to 40,000 ft. approximately 8½ minutes	
		Service ceiling 48,000 ft.	
<i>Production:</i>			
	(Prototype)	<i>WG236, WG240, XF828</i>	
	(Sea Vixen F.A.W.1)	(c/n. 10001-021) <i>XJ474-XJ494</i> ; (022-037) <i>XJ513-XJ528</i> ; (038-068) <i>XJ556-XJ586</i> ; (069-078) <i>XJ602-XJ611</i> ; (079-090) <i>XN647-XN658</i> ; (091-118) <i>XN683-XN710</i> ; (119) <i>XP918</i>	
	(Sea Vixen F.A.W.2)	(c/n. 10120-126) <i>XP919-XP925</i> ; (127-133) <i>XP953-XP959</i> ; (134-148) <i>XS576-XS590</i>)	
<i>Service Use:</i>			
	(a) Sea Vixen F.A.W. Mk. 1		
	No. 890 Squadron, R.N.A.S. Yeovilton and H.M.S. <i>Ark Royal</i> ; No. 892 Squadron, H.M.S. <i>Centaur</i> ; No. 893 Squadron, H.M.S. <i>Victorious</i> ; No. 766 Squadron, Yeovilton (renamed Naval Air Fighter School 1962); No. 899 (H.Q.) Squadron, Yeovilton.		
	(b) Sea Vixen F.A.W. Mk. 2		
	No. 892 Squadron, H.M.S. <i>Hermes</i> ; No. 893 Squadron, H.M.S. <i>Victorious</i> ; No. 899 Squadron, H.M.S. <i>Eagle</i> ; Naval Air Fighter School, Yeovilton; F.R.U., Yeovilton.		



D.H. 110 SEA VIXEN F.A.W. Mk. 1

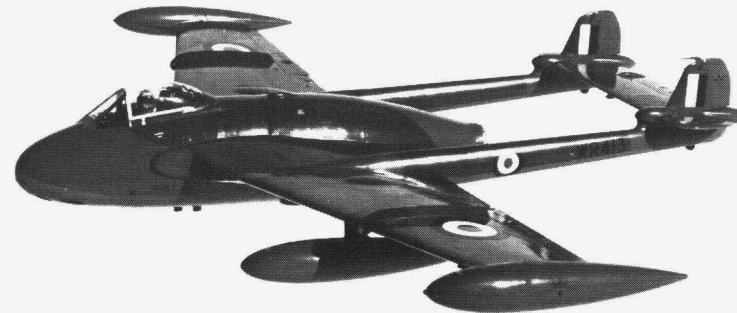


D.H.112 Venom F.B. Mk. 50 serial 352, delivered to the Royal Iraqi Air Force in August 1953. This mark and the R.A.F.'s Venom F.B. Mk. 1 were externally identical. (De Havilland Photo.)

De Havilland D.H.112 Venom

The Venom was a high performance, single seat fighter-bomber developed from the Vampire to exploit fully the high thrust of the D.H. Ghost turbine engine. Although originally known as the Vampire F.B. Mk. 8, it was an entirely new design having a wing of thinner aerofoil section with sweep back only on the leading edge. This not only permitted speeds nearer to that of sound but also provided a useful recognition feature. The 75 gallon jettisonable combat fuel tanks fitted to the wing tips were the first ever fitted to an R.A.F. fighter, wind tunnel tests having shown this arrangement more efficient than pylon-mounted tanks at half span as on the Vampire. For experimental purposes the second prototype Venom, *VV613*, was fitted with both types of tank.

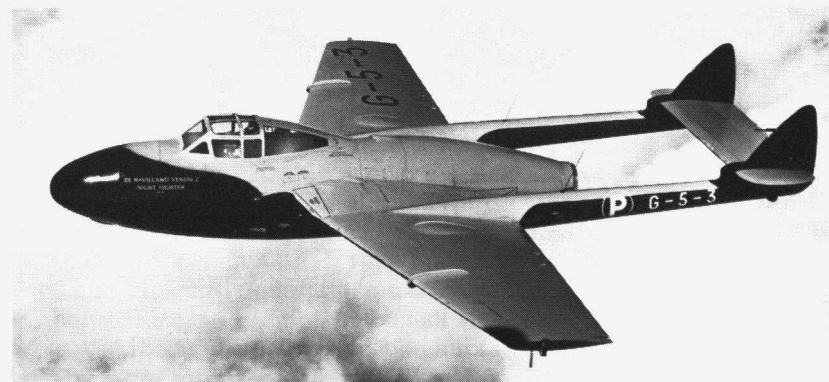
The first prototype Venom, *VV612*, first flew at Hatfield on September 2, 1949 and after extended trials went into large scale production at Chester and by the Fairey Aviation Co. Ltd. at Ringway as replacement for the Vampire F.B. Mk. 5 to Air Ministry Specification 15/49. A scheme for the construction of 160 Venom F.B. Mk. 1s commencing *WL892*, by the Bristol Aeroplane Co. Ltd. at Filton, was, however, abandoned. The armament consisted of four 20 mm. British Hispano Mk. 5 cannons in the nose and 2,000 lb. of bombs or eight 60 lb. rocket projectiles on racks under the wing. Wing fences were fitted to eliminate tip-stall on the approach and the first aircraft for the R.A.F. flew in June 1951. An early production aircraft, *WE256*, was to have been flown by John Derry in the Jubilee Trophy Race at Hatfield on June 23rd but bad weather prevented it showing its paces before the type was issued to squadrons of the Second Allied Tactical Air Force in Germany. Their first experimental operation



Royal Air Force D.H.112 Venom F.B. Mk. 4 serial *WR413*, showing the revised tail surfaces and underwing fuel tanks. (De Havilland Photo.)

took place at Wunsdorf during Exercise "Mainbrace" in September 1952 but for a time initial teething troubles imposed a number of flight limitations. When these were removed the Venom quickly established a high reputation, not only in the ground attack role but also for its manoeuvrability and climb as a high altitude interceptor, dramatically demonstrated by R. Plenderleith in the first prototype fitted with reheat at the Farnborough S.B.A.C. Show in September 1952.

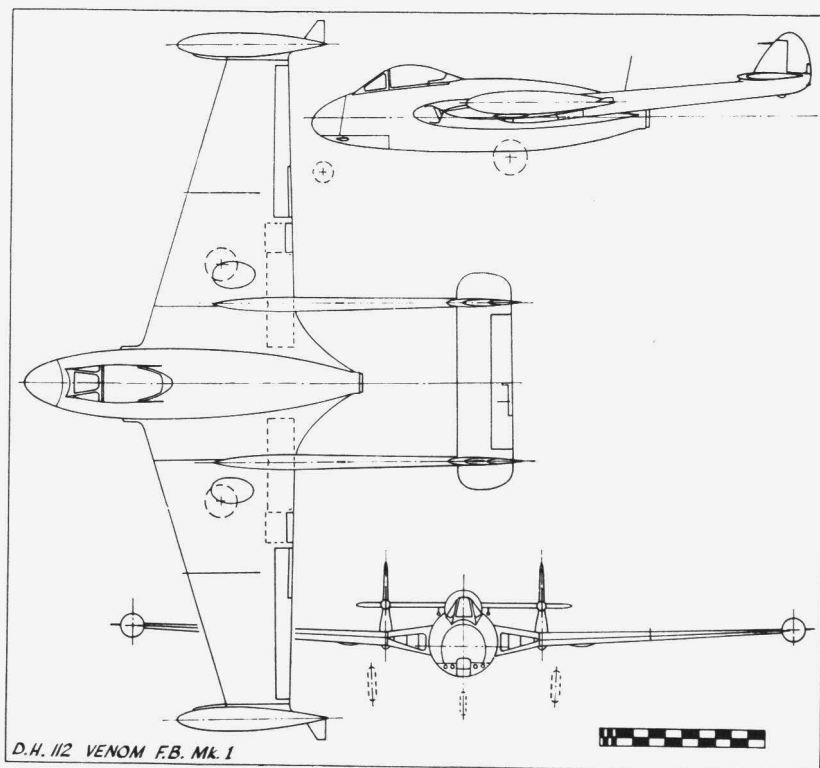
In 1954 Venom F.B. Mk. 1s re-equipped the Middle East Air Force and in the following year an improved version designated Venom F.B. Mk. 4 was produced, the prototype of which, *WE381*, first flew on December 29, 1953. The F.B. Mk. 4 was fitted with a later mark of Ghost, and hydraulically operated ailerons having artificial feel to give improved control at high Mach numbers. The aircraft was identified externally by redesigned tail surfaces having kidney shaped fins and rudders to prevent excessive yaw and possible rudder locking at low air speeds. Late production Venom F.B. Mk. 4s were also equipped with a pilot's ejector



The prototype Venom N.F. Mk. 2. (De Havilland Photo.)

seat, and replaced the F.B. Mk. 1 in Germany where No. 266 Squadron won the Duncan Trophy for gunnery with them in 1954. Venom F.B. Mk. 1s of No. 14 Squadron R.N.Z.A.F. and F.B. Mk. 4s of No. 60 Squadron, based at Tengah by the Far East Air Force, were responsible for the air defence of Singapore and made many attacks on Malayan terrorists. One out-dated Venom Mk. 1 was flown at Farnborough in 1955 with R.F.D. high speed target towing equipment in underwing containers.

The intermediate mark numbers were allocated to two seat fighter derivatives built to succeed the Vampire N.F. Mk. 10. They originated with the private venture Venom Mk. 2 night fighter, G-5-3, first flown at Hatfield on August 22, 1950 and demonstrated by John Derry at the Farnborough S.B.A.C. Show in the following month. It used standard Venom wings and tail booms fitted to a new and wider fuselage accommodating pilot and radar operator side by side for efficient team work, and under the direction of W. A. Tamblin was developed at Christchurch into the Venom N.F. Mk. 2 with A.I. radar in an elongated nose. The first production machines went to No. 23 Squadron, Coltishall in 1953 where they made their operational debut in Exercise "Dividend" in July of the following year. Following the discovery of a small crack in a



number of wheel wells, a defect later remedied by local strengthening, temporary restrictions were placed on all flying below 10,000 ft. Many of these aircraft were later modified to Venom N.F. Mk. 2A with the dorsal fins of the Vampire T. Mk. 11, clear view canopy and the kidney shaped fins and rudders of the Venom F.B. Mk. 4. The bullet fairings at the intersection of tailplane and fin were transferred however to the trailing edge to reduce the possibility of tail buffeting at high Mach numbers. Paralleling the Venom F.B. Mk. 4, the N.F. Mk. 3, first flown on February 22, 1953 had power operated ailerons, a wholly inset tailplane, improved A.I. radar in a completely symmetrical radome, and clear view hinged canopy with power jettison. No. 141 was the first squadron to use it and in 1955 operated from Coltishall in Exercise "Beware". The type completed its operational career when No. 208 Squadron returned from Kenya to re-equip with Hunters at Stradishall in March 1960.



Production D.H.112 Venom N.F. Mk. 3 WX787, showing the wholly inset tailplane and dorsal fin. (De Havilland Photo.)

Evaluation of de Havilland's Venom 2 prototype G-5-3 by the Royal Navy as WP227 led to the construction at Christchurch of an all-weather fighter prototype WK376 to Specification N.107, strengthened for catapult take off and equipped with deck arrestor hook. It was designated Sea Venom N.F. Mk. 20 and made the first carrier trials from H.M.S. *Illustrious* on July 9, 1951. Later the Christchurch design team produced power operated folding wings with which to equip the third prototype WK385. Production aircraft were fitted with an improved canopy which could be jettisoned under water, a beak-like fairing on top of the tail pipe to house the arrestor hook and small wing tip slats. Designated Venom F.A.W. Mk. 20, the first production aircraft, WM500, flew on March 27, 1953 and WM567 (the 50th and last), on June 6, 1955. Modifications embodied in the R.A.F.'s two seat Venoms were then applied to the naval

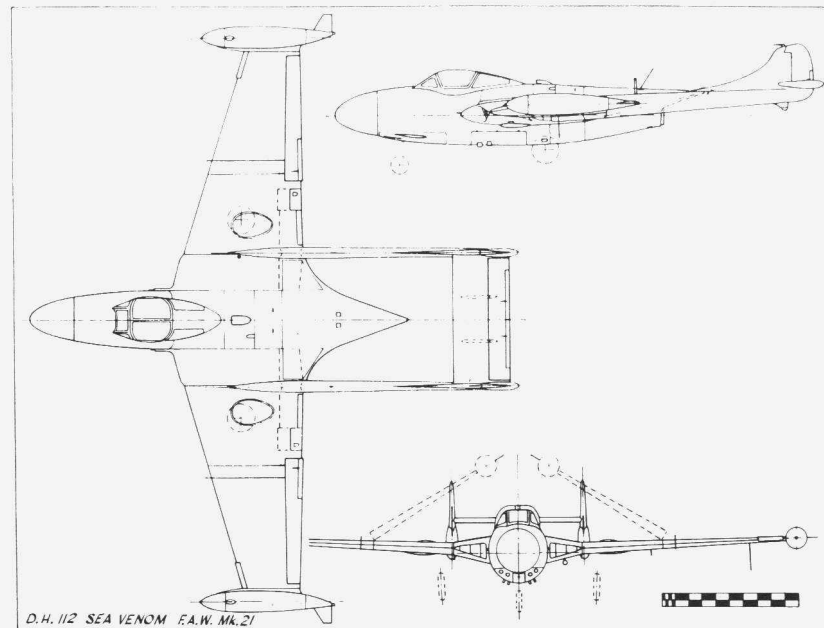
version, creating the F.A.W. Mk. 21 with power operated ailerons; clear view, clam shell jettisonable canopy; Martin-Baker Mk. 4 ejection seats; long stroke undercarriage and provision for RATOG. The engine was an uprated de Havilland Ghost 104. Deliveries commenced with *WM568*, first flown on April 22, 1954 and ended with *XG680* which flew on June 6, 1957. The next aircraft, *XG681*, was the first of a later version known as the Venom F.A.W. Mk. 22 with Ghost 105 engine. The final aircraft was *XG737*.

No. 890 Squadron was re-formed with the first Sea Venom F.A.W. Mk. 20s at Yeovilton on March 20, 1954 and later embarked in a carrier after converting to F.A.W. Mk. 21s, the deck landing trials with which had been made by the Boscombe Down test pilot Cdr. S. G. Orr on H.M.S. *Albion* in the summer of that year. No. 809, an existing all-weather squadron, then forsook its Sea Hornets for the new equipment and eventually H.M. Aircraft Carriers *Albion*, *Ark Royal* and *Eagle* were all equipped with Sea Venoms which co-operated with F.B. Mk. 4s from Cyprus in the Anglo-French intervention in Egypt. On November 1, 1956 they strafed five enemy airfields, destroying 14 aircraft including some MIG 15s and on ensuing days attacked airfields, tanks and lorry convoys all over the Nile Delta.



Production Sea Venom F.A.W. Mk. 20 *WM512*, showing the arrester hook housing.
(Charles E. Brown.)

The Sea Venom was used by No. 831 Squadron on airborne early warning duties and as it was also one of the few night fighters which could intercept jet bombers such as the Canberra, its crews were provided with pressure breathing waistcoats and modified oxygen equipment. In 1956 the experimental department at Christchurch under W. A. Tamblin equipped Sea Venom Mk. 21 *XG663* with blown flaps, using air bled from the compressor of the Ghost engine. In deck landing trials on *Ark Royal* in April 1956, a reduction of 15 knots in stalling speed was achieved. Later a Venom N.F. Mk. 2 was used in the development of reverse thrust and Venom F.B. Mk. 4, *WL813*, piloted by M. P. Kilburn made the first



air firings at Aberporth of the D.H. Firestreak guided missile, destroying a Firefly drone in the process. Service trials of the Firestreak were conducted at Ford by No. 700 Naval Trials Squadron, one of whose test vehicles was *XG607*. Royal Navy firing trials began early in December 1958 when three Sea Venom F.A.W. Mk. 21s of No. 893 Squadron were catapulted from H.M.S. *Victorious* in the Mediterranean and recorded 80% direct hits on Malta-based Fireflies. While *Victorious* was refitting, these aircraft had been flown to Christchurch for the installation of the Firestreak power supply, control equipment and launching pylons of the type then under development for the D.H.110 Sea Vixen.

In view of the Vampire's popularity overseas, export versions of the Venom were offered under the designations F.B. Mk. 50, N.F. Mk. 51 and N.F. Mk. 52 for the day fighter, night fighter and naval fighter respectively. A number of F.B. Mk. 50s equipped No. 6 Squadron of the Royal Iraqi Air Force at Habbaniya in 1955 while 150 F.B. Mk. 1s and 100 F.B. Mk. 4s were built in Switzerland by a consortium of three companies for the Swiss Air Force. A scheme for Fiat to build the F.B. Mk. 50 in Italy as the G.81 was shelved and the Italian Air Force received only two British-built machines. In 1956 No. 34 Squadron of the Venezuelan Air Force was equipped with 22 Venoms but in this case the British F.B. Mk. 4 was chosen. Venom N.F. Mk. 51s (33001-33062) built at Chester and Ringway for the Royal Swedish Air Force were designated J33 and fitted with Ghost engines built at Trollhättan, Sweden by the Svenska Flygmotor Company

and shipped to England for installation. At least four later flew for Svensk Flygtjänst A.B. in civil markings as *SE-DCA*, 'CB', 'CD' and 'CE' on military target towing contracts. *SE-DCD* was subsequently presented to the Air Force Museum at Malmöslätt.

Four Sea Venom Mk. 20s were erected in France by S.N.C.A. du Sud-Est and equipped with Fiat-built Ghost 48 engines as S.E. Aquilon 20 prototypes, equivalent to the export Sea Venom Mk. 52 and first flown February 20, 1952. They were followed by the single French-built Aquilon 201, No. 05 *F-WGVT*, with short stroke undercarriage and ejector seats for catapult trials at the R.A.E. Farnborough in November 1954. Sud-Est then built 75 Aquilon 202s with long stroke undercarriages, 40 single seat Aquilon 203s and the unarmed Aquilon 204 trainer with short stroke undercarriage. One Aquilon flew from Orly to Hyères on the Mediterranean in 48 minutes in March 1955.

The F.A.W. Mk. 53 built at Christchurch for the Royal Australian Navy differed from the F.A.W. Mk. 21 only in its radar and combat equipment. In one of these, Lt. J. Overbury R.N. accompanied by Lt. Cdr. Kable R.A.N. established a new inter-city record between Rome and Malta on July 2, 1955 at an average speed of 534 m.p.h. The Mk. 53s equipped No. 808 Squadron R.A.N., formed at Culdrose on August 23, 1955 with aircraft commencing *WZ893*. After a working up period over the Channel they embarked for Australia in H.M.A.S. *Melbourne* in March 1956 but early in the following year a small defect was found in the wing structure of F.A.A. and R.A.N. Sea Venoms causing a temporary ban on catapulting after which they were based ashore at Nowra.

With the introduction of the D.H.110 Sea Vixen in 1960, the Sea Venoms of the Royal Navy were progressively withdrawn from service and hundreds were reduced to scrap at Lossiemouth. Venom N.F. Mk. 3 *WX853* is preserved at the Mosquito Museum, Salisbury Hall.

When the Swiss Air Force began disposing of F.B.50s in 1984 Venoms once again appeared in Britain. A number were allocated civil marks but the majority were either grounded or quickly re-exported to the U.S.A.. However one, Sandy Topen's Cranfield based *G-BLKA/J-1790*, appeared on the 1986 Air Show circuit in a double act with Vampire T.11 *G-VTH/WZ507*.

SPECIFICATION AND DATA

Manufacturers: The De Havilland Aircraft Co. Ltd., Hatfield Aerodrome, Herts., Hawarden Aerodrome, Chester and Christchurch Aerodrome, Hants.
The Fairey Aviation Co. Ltd., Ringway Aerodrome, Manchester
Société Nationale de Constructions Aéronautiques du Sud-Est, Marignane Aerodrome, Marseilles, France
Società per Azioni Fiat, Turin, Italy
A combine formed by the Swiss Federal Aircraft Plant, Emmen; Flug und Fahrzeugwerke A.G., Altenrhein; and Pilatus Flugzeugwerke A.G., Stans, Switzerland

Power Plants: (F.B. Mk. 1 and 4; N.F. Mk. 2; F.A.W. Mk. 20)

One 4,850 lb. s.t. de Havilland Ghost 103

(N.F. Mk. 3; F.A.W. Mk. 21 and F.A.W. Mk. 53)

One 4,950 lb. s.t. de Havilland Ghost 104

(F.A.W. Mk. 22) One 5,300 lb. s.t. de Havilland Ghost 105

(Aquilon—all marks) One 4,840 lb. s.t. de Havilland Ghost 48

Dimensions, Weights and Performances:

The following details only have been made available for publication.

	F.B. Mk. 1 F.B. Mk. 4	N.F. Mk. 2 F.A.W. Mk. 20	N.F. Mk. 3 F.A.W. Mk. 21	F.A.W. Mk. 22	F.A.W. Mk. 53
Span	41 ft. 8 in.	42 ft. 11 in.	42 ft. 11 in.	42 ft. 11 in.	42 ft. 11 in.
Length	31 ft. 10 in.	33 ft. 1 in.*	36 ft. 7 in.**	36 ft. 7 in.	36 ft. 7 in.
Height	6 ft. 2 in.	7 ft. 7 in.	6 ft. 6 in.	8 ft. 6 in.	8 ft. 6 in.
Wing area	279½ sq. ft.	279½ sq. ft.	279½ sq. ft.	279½ sq. ft.	279½ sq. ft.
All-up weight	15,400 lb.	—	—	15,800 lb.	15,800 lb.
Maximum speed	640 m.p.h.	—	630 m.p.h.	575 m.p.h.	587 m.p.h.
Initial climb	9,000 ft./min.	—	8,762 ft./min.	5,900 ft./min.	8,762 ft./min.
Ceiling	—	—	49,200 ft.	40,000 ft.	49,200 ft.
Range	—	—	1,000 miles	705 miles	1,000 miles

* F.A.W. Mk. 20 36 ft. 4 in.

** N.F. Mk. 3 not recorded.

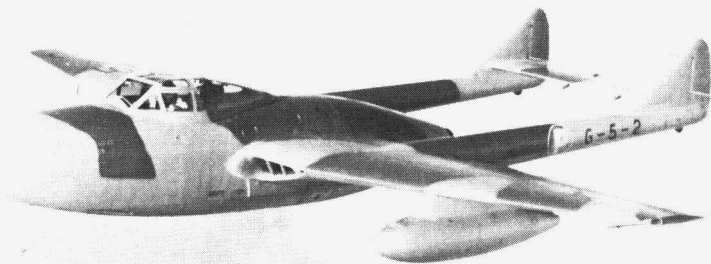
Production:

Total production, including foreign contracts, amounted to 1,143 aircraft of which 742 were Venoms for the R.A.F. and 295 were Sea Venoms for the R.N. and R.A.N.

Mark	Serial ranges
Prototypes	(Venoms) <i>VV612-613</i> ; <i>XA539</i> for trials in 1954. (Sea Venoms) <i>WK376</i> , <i>WK379</i> , <i>WK385</i>
F.B. Mk. 1	<i>WE255-294</i> , <i>WE303-332</i> , <i>WE340-389</i> , <i>WE399-438</i> , <i>WE444-483</i> (<i>WE381</i> became F.B. Mk. 4 prototype); <i>WK389-438</i> , <i>WK468-503</i> ; <i>WR272-321</i> , <i>WR334-373</i> . Built in Switzerland: <i>J-1501</i> to <i>J-1650</i>
N.F. Mk. 2	Prototype <i>G-5-3/WP227/7098M</i> ; <i>WL804-833</i> , <i>WL845-874</i> ; <i>WR779-808</i>
N.F. Mk. 3	Prototype <i>WV928/7189M</i> ; <i>WX785-810</i> , <i>WX837-886</i> , <i>WX903-949</i> ; <i>WZ315-320</i>
F.B. Mk. 4	<i>WR374-383</i> , <i>WR397-446</i> , <i>WR460-509</i> , <i>WR525-564</i> ; Venezuela <i>1A-34</i> to <i>7A-34</i> , <i>1B-34</i> to <i>7B-34</i> , <i>1C-34</i> to <i>8C-34</i> . Built in Switzerland: <i>J-1701</i> to <i>J-1800</i>
F.B. Mk. 50	Iraq <i>352-370</i> ; Italy <i>MM.6153</i> , <i>MM.6154</i> (c/n 12566, 12567)
N.F. Mk. 51	Sweden <i>33001-33062</i> (<i>33014</i> , <i>022</i> , <i>025</i> , <i>041</i> later <i>SE-DCA</i> , 'CB', 'CD', 'CE')
F.A.W. Mk. 20	<i>WM500-523</i> , <i>WM542-567</i>
F.A.W. Mk. 21	<i>WM568-577</i> ; <i>WW137-154</i> , <i>WW186-225</i> , <i>WW261-298</i> ; <i>XG606-638</i> , <i>XG653-680</i>
F.A.W. Mk. 22	<i>XG681-702</i> , <i>XG721-737</i>
F.A.W. Mk. 53	<i>WZ893-911</i> , <i>WZ927-946</i> for Royal Australian Navy (c/n 12750-12788)

Service Use:

- Venom F.B. Mk. 1 and 4—In Germany with Nos. 5, 11, 16, 94, 98, 145 and 266 Squadrons. In the Middle East with Nos. 6, 8, 32 and 249 Squadrons. In the Far East with Nos. 28 and 60 Squadrons R.A.F. and No. 14 Squadron R.N.Z.A.F.
- Venom N.F. Mk. 2 and 3—In the United Kingdom with Nos. 23, 33, 141, 151 and 253 Squadrons
- Sea Venom F.A.W. Mk. 20, 21 and 22—With Nos. 809, 831, 890, 891, 893, 894 and 895 Squadrons. Also with No. 700 Naval Trials Squadron and Nos. 738 and 766 Training Squadrons
- Sea Venom F.A.W. Mk. 53—Thirty-nine shipped to Australia per H.M.A.S. *Melbourne* 1956. Served with No. 724 Sqn. R.A.N., Nowra, N.S.W. (training); Nos. 805, 808 and 816 Sqns. aboard *Melbourne*. Some converted to T.T. Mk. 53. Type serial *N4* allotted 1964.



The prototype D.H.113 Vampire Night Fighter G-5-2, with experimental tail surfaces.
(De Havilland Photo.)

De Havilland D.H.113 Vampire N.F.Mk.10

This night fighter was a Vampire 5 fitted with a two seat cockpit of the type used on the Mosquito and powered by a Goblin 3 turbojet. Such grafting, made possible by the similarity in diameters of the Vampire nacelle and the Mosquito fuselage, provided accommodation for pilot and radar operator side by side in a lengthened nose carrying A.I. Mk. 10 radar. Two prototypes G-5-2 and G-5-5 were built, the first of which flew at Hatfield for the first time on August 28, 1949 piloted by G. H. Pike, only a few days before demonstration at the Farnborough S.B.A.C. Show. Standard armament of four 20 mm. Hispano cannon was retained and provision made for 100 gallon underwing long range fuel tanks at half span. Trials led first to a deletion of the fin acorns and to a slight increase in fin area, and finally to the taller rudders and increased tailplane span of the Venom.

The D.H.113 was intended initially for export and 12 were ordered by the Egyptian Government in October 1949 but when the export of arms to Egypt was banned, they were taken over by the R.A.F. under the designation Vampire N.F. Mk. 10 as an interim type pending the delivery of Meteor and Venom night fighters. Allotted serials commencing WP232, they were first issued to No. 25 Squadron at West Malling in July 1951 to replace Mosquito N.F. Mk. 36s. No. 23 Squadron, Coltishall was similarly re-equipped in the following September when No. 151 Squadron re-formed at Leuchars as the third Vampire N.F. Mk. 10 unit.

For safety reasons the R.A.F. always insisted on twin engined night fighters and the introduction of N.F. variants of the Vampire and Venom was purely a temporary measure resulting from worsening East-West relations and pending the delivery of the new Armstrong Whitworth-built Meteor N.F. Mk. 11s.

The Vampire N.F. Mk. 10's short, 2½ year, Service career was thus limited to the above three home defence squadrons, each of which had an establishment of 16 fighters, and by the time the type had been completely phased out—in May 1954—at least 25 new and unused aircraft were still at storage units. A few were retained for trial purposes such as WP249 which was evaluated at the A. & A.E.E., Boscombe Down while WP250 went to Radlett to be flown by Handley Page Ltd. for experimental work on boundary-layer suction laminar flow wing sections. From 1953–56 it flew with various 5 ft. test sections outboard of the port tail boom, using air tapped from the engine compressor. In every case a dummy section was fitted on the starboard side to avoid asymmetric drag. WP240 which was to have been flown by John Cunningham in the abortive Jubilee Trophy Race at Hatfield on June 23, 1951, was used in 1955 to air test the Sea Vixen radome.

Ninety-five Vampire N.F. Mk. 10s were built, 62 at Chester, some of



D.H.113 Vampire N.F. Mk. 10s of No. 25 Squadron at West Malling on February 22, 1952. (Fox Photo.)

which (e.g. MM6167) were delivered to the Italian Air Force under the designation Vampire N.F. Mk. 54. One was evaluated by the Swiss Air Force as J1301. Some surplus R.A.F. aircraft were fitted with improved cockpit canopies and retained for use by Nos. 1 and 2 Air Navigation Schools at Topcliffe and Thorney Island respectively. These continued in use until 1959 but a considerable number returned to de Havilland's Chester works to be re-worked and re-equipped internally to N.F. Mk. 54 standard as interim all weather fighters for the Indian Air Force. These were delivered by air in two main batches via Blackbushe and Bahrein between August 1957 and February 1958.

SPECIFICATION AND DATA

Manufacturers: The de Havilland Aircraft Co. Ltd., Hatfield Aerodrome, Herts. and Hawarden Aerodrome, Chester

Power Plant: One 3,350 lb. s.t. de Havilland Goblin 3

Dimensions: Span 38 ft. 0 in. Length 34 ft. 7 in.
Height 6 ft. 7 in. Wing area 261 sq. ft.

Weights: Tare weight 6,984 lb. All-up weight 13,100 lb.*

Performance: Maximum speed 538 m.p.h.** Initial climb 4,500 ft./min.
Range 1,220 miles*

* With drop tanks.

** At sea level.

Production:

(At Hatfield) WP232-WP256

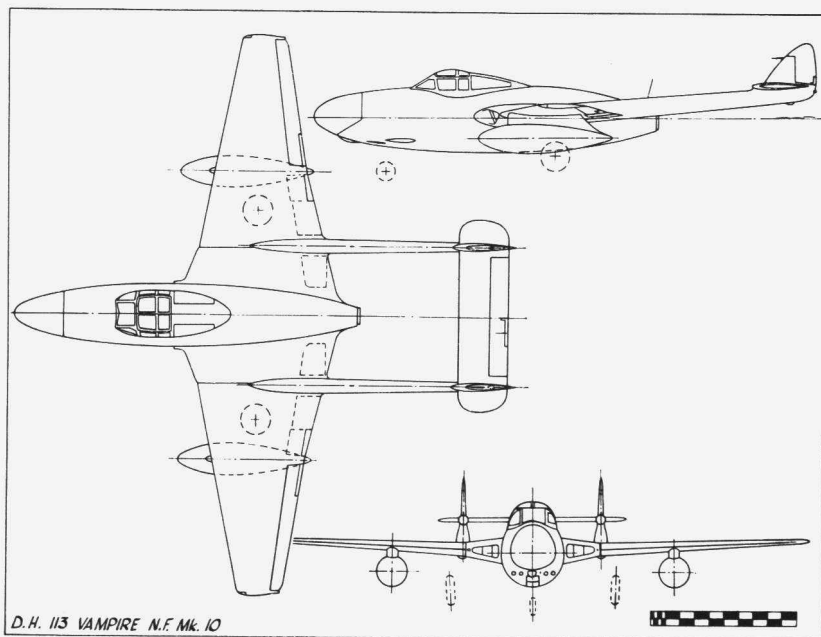
(At Chester) WM659-WM677; WM703-WM733 (c/n 13032-13081); WV689-691 (c/n 13083-13085)

(To India) ID592-ID605 ex WM724, 659, 719, 665, 721, 728, 667, 720, 664, 662, 660, 666, 661, 675

ID606-ID609 ex WV690, WV689, WM715, 710

ID1601-ID1612 ex WM731, 732, 723, WV691, WP246, 249, WM708, 709, 725, 676, 717, 707

Service Use: No. 23 Squadron, R.A.F. Coltishall; No. 25 Squadron, West Malling; No. 151 Squadron, Leuchars; No. 1 A.N.S., Topcliffe; No. 2 A.N.S. Thorney Island; Central Navigation and Control School, Shawbury; R.A.F. College, Cranwell; R.A.F. Handling Squadron, Manby.



The prototype D.H.114 Heron G-ALZL, c/n 10903, in its original condition with straight tailplane. (De Havilland Photo.)

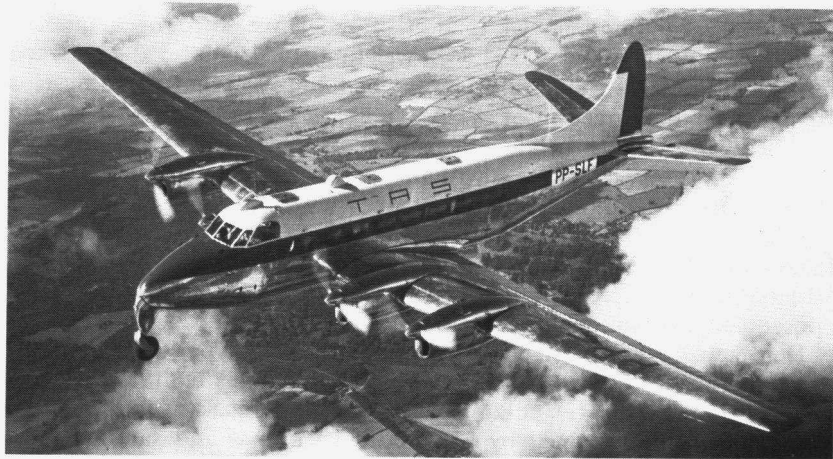
De Havilland D.H.114 Heron

An enlarged four engined version of the Dove, forming a modern counterpart of the prewar D.H.86B, was first considered in 1945 but the market did not then exist and it was not until 1949 that detail designs began under the direction of W. A. Tamblin. Emphasis was on rugged simplicity in order to produce a truly economical vehicle for short or medium stage services in areas without proper aerodromes. It was devoid of complicated hydraulics, the undercarriage was fixed, and the engines—ungeared, unsupercharged Gipsy Queen 30s—were renowned for reliability and long inter-overhaul life. They drove two bladed de Havilland variable pitch airscrews and the aircraft's small field performance was consequently exceptional.

Heron was the chosen type name and the prototype, G-ALZL, first flown at Hatfield by G. H. Pike on May 10, 1950 was built largely from existing components, including Dove outer wing panels as well as Dove nose and tail units joined by lengthened keel, roof and side members from the same aircraft. Accommodation was for two pilots and 14 passengers, but three extra seats could be fitted if no toilet were carried.

At the end of 180 hours development flying by G. H. Pike, during which the original tailplane gave place to one with dihedral, the prototype left for tropical trials at Khartoum and Nairobi. In May 1951 a high pressure sales drive began in the course of which it bore many insignia including those of Morton Air Services Ltd., B.E.A.C., Japan Air Lines, and during a fortnight's visit to Scandinavia in 1954, the Norwegian registration *LN-BDH*. Trial installation of the Gipsy Queen 30-3 was made in 1951, of the Gipsy Queen 30-4 in 1956 and later 'ZL' was brought up to full production standard for Jersey Airways Ltd. with Gipsy Queen 30 Mk. 2 engines.

New Zealand National Airways Ltd. bought the first production Heron, which left Hatfield on its 13,000 mile delivery flight on April 2, 1952 and exactly a year later inaugurated services with three others across the Cook Strait between Wellington, Nelson and Blenheim. The second, third and fifth machines opened the Oslo-Stavanger service of Braathens S.A.F.E. Air Transport on August 18, 1952 but only seven Herons were built at Hatfield before the production line was transferred to Chester. *G-AMTS*, last of the seven, was the prototype Heron 2 with retractable undercarriage, first flown on December 14, 1952. Without undercarriage drag it was 20 m.p.h. faster than the Heron 1 and had an improved fuel consumption which sounded the death knell of the earlier mark, the last of which was B.E.A.C.'s *G-AOFY*, delivered on April 12, 1956. Production continued at a slow rate and the 143rd Heron was completed at Chester during May 1961. The type saw service in 30 countries and later operated as Heron 1B or 2B at an increased all-up weight of 13,000 lb. As in the case of the Dove, the A suffix was reserved for Herons with special furnishings for the American market, the first and only example being Illini Airlines' Heron 2A *N3999A*.



Heron 1 *PP-SLF*, c/n 14003 of Transportes Aereos Salvador, showing the dihedral tailplane fitted to all production aircraft. (De Havilland Photo.)

Early users of the Heron 1 also included Butler Air Transport Ltd. who ran mail and air-bus services in the outback areas of New South Wales and Southern Queensland; Transportes Aereos Salvador whose scheduled services linked Salvador, Brazil with six towns in Bahia state; Union Aéromaritime de Transport, operator of local services in the French Cameroons and the Pacific; Jersey Airways Ltd. which commenced Heron services to the Channel Islands on May 9, 1953 and eventually owned seven; Primeras Lineas Uruguayas de Navegacion Aerea (P.L.U.N.A.) on routes between Montevideo, Salto, Melo and Artigas; Garuda Indonesian Airways which employed the largest single Heron fleet numbering 14 aircraft on a vast island network centred on Djakarta; and Japan Helicopter and Aeroplane Co. Ltd. whose three original Heron 1Bs operated mail and feeder services between Osaka and Tokyo in the colours of All Nippon Airways.

In February 1955 two 1Bs *G-ANXA* and *'XB* replaced Rapides on the Scottish ambulance runs and on B.E.A.C. scheduled services between Renfrew-Barra and Renfrew-Benbecula, where their short take off ability was put to good use on small beach airstrips. In the south, Cambrian Airways Ltd. operated a Heron 1B and two Heron 2Bs between Cardiff and the Midlands, Belfast, Jersey and Paris. Heron 1B *F-OANQ*, formerly in the Cameroons as *F-BGXU*, had flown 7,000 hours since 1958 on Transpac's inter-island services in New Caledonia, while three former N.Z.N.A.C. Heron 1s of Fiji Airways Ltd. connected Suva with the international airport at Nandi, 135 miles away.

1954 was the year in which the Heron 2 first found favour as a luxury private transport, a role in which it excelled in the business world for many years. In that year, *ZS-DIG* was supplied to the Anglo American Corporation of South Africa Ltd.; *CGG* to the Governor General of the Belgian Congo to replace a Dove with the same markings; and *XG603* in R.A.F. markings to the British Joint Services Mission. This was the first Heron to go into service in the U.S.A., having been flown out by the northern route for the personal use of the British Ambassador in Washington. It was forerunner of a similar V.I.P. Heron, *XH375*, delivered to the Queen's Flight at Benson in May 1955 and later flown extensively by H.R.H. Prince Philip. This in turn led to two V.V.I.P. series 3 aircraft delivered to the Queen's Flight in April 1958, one of which was flown to Ghana by the Duke on November 22, 1959. The Heron C. Mk. 4, commencing *XR391*, was introduced in May 1961.

The first production Mk. 2B was Saudi Arabian *SA-R5*, 50th machine built and personal aircraft of Prince Talal al Saud. First of the mark to fly however was the 52nd aircraft *G-ANOL* "Excalibur"; placed at the disposal of H.R.H. Princess Margaret during her visit to the West Indies in 1955. In company with a later model *VP-BAN*, it flew on the routes of Bahamas Airways Ltd. as *VP-BAO*. Major modifications were few, the most significant being the wide chord rudder introduced in 1955, and de Havilland fully feathering airscrews, first demonstrated on the 82nd



D.H.114 Heron 2 serial 120, c/n 14085, delivered to the South African Air Force in October 1955, was one of the first of the type to be fitted with the wide chord, bulged rudder. (De Havilland Photo.)

aircraft *G-ANCJ*, at the 1955 S.B.A.C. Show. These airscrews are available as an optional extra amending the designation to Heron 2C. Two examples, *G-ANUO* and *'OHB*, with executive interior and operating at a still higher all-up weight of 13,500 lb. were designated Heron 2D, and based at London Airport to maintain communications with Shell interests in Amsterdam. The Canadian Comstock Company used *CF-HLI*, delivered by the northern route as *G-ANPA* in 1954, for industrial surveys and coast to coast executive flying in Canada. Others were used for similar purposes by Rolls-Royce Ltd., Vickers-Armstrongs (Aircraft) Ltd. and English Electric Aviation Ltd. A custom built version, *G-APMV*, with four V.I.P. and eight other seats and also an electric galley, was known as the Heron 2E and was based at Turnhouse by Ferranti Ltd. Similar de luxe Herons were used overseas, *PH-ILA* with Phillips of Eindhoven; *N4789C* in Alaska; *I-BKET* by Signor Agnelli of the Fiat Company in Italy; *CN-MAA* by the Sultan of Morocco and *XB-ZIP* by the Banco Nacional de Mexico. The last mentioned had a considerably improved performance after being fitted in 1959 with 340 h.p. Lycoming engines by Vest Aircraft de Mexico S.A.

The 14 seat Heron 2B served for many years with major airlines, seven aircraft with Devlet Hava Yollari on local services in Turkey; eight with the Indian Airlines Corporation on routes covering Kashmir, Assam and the Deccan; eight with the West African Airways Corporation; *CR-IAA* and *'AB* in Portuguese India; *LN-BDS* with Vestlanske Luftfartsselskap in Norway; two with Ghana Airways; five with Itavia, Rome; and eight 2Ds with Aviacion y Comercio S.A. for Spanish internal and North African

services radiating from Madrid. They also served with Communications Flights in the air forces of Saudi Arabia, South Africa, Ceylon, Iraq, West Germany, Jordan and Ghana. These included *RF-5* once maintained as the personal aircraft of King Feisal of Iraq, and those frequently used by King Hussein of Jordan and President Nkrumah of Ghana. *VP-KVC*,



Heron 2 *I-BKET*, supplied to the Fiat Motor Company for executive use in June 1957, served with Humber Ltd. in a similar capacity 1962-65 as *G-ARUA*.

supplied to the Director of Civil Aviation, East Africa, was flown by Capt. R. F. Caspareuthus on airways radio aid calibration.

By 1957 airline Herons were being replaced by larger aircraft and the Butler machines were flown from Australia to Bahrain and handed over to Gulf Aviation Ltd. The first production Heron, ferried from New Zealand to Bahrain, was wrecked in the mountains of Southern Italy while en route to Leavesden for overhaul as *G-APJS* on February 18, 1958. In that year the four P.L.U.N.A. Heron 1s returned to Britain by sea and after overhaul at Ringway two joined their brethren in the service of Gulf Aviation Ltd. One of the Garuda fleet returned to Croydon in 1957 and in conjunction with a Heron 2, flew on the Gatwick-Swansea and Gatwick-Rotterdam routes of Morton Air Services Ltd. A second Garuda machine was presented to the Indonesian Aviation Academy as a ground instructional airframe and in May 1960 the remaining 12 were shipped to Chofu, Japan for overhaul by C. Itoh and Co. for Japanese domestic services.

In May 1961 the Royal Navy replaced five Sea Devon communications aircraft with a similar number of ex-civil Heron 2s. Delivered to Lee-on-



The former West German Air Force V.I.P. Heron 2 CA-001 after Lycoming conversion by Connellan Airways Pty. Ltd. in Australia. (*Aviation Photo News*.)

Solent under the designation Sea Heron C. Mk. 20, they included two former Jersey Airlines' machines and three surplus West African Airways' aircraft specially overhauled by the manufacturer at Leavesden.

Mexico's Lycoming engined Heron was forerunner of conversions made in Australia by Connellan Airways, Alice Springs, and in Florida by Riley Aeronautics who produced Riley Herons with even better payload and performance by fitting turbo-supercharged Lycomings. Examples were N4789C and N12517, part of the 18-strong Heron fleet of Puerto Rico International Airlines; Wright Airlines' N506W to N510W; Royalair of Canada's CF-RAB; and Shell's Venezuelan-based YV-P-AEB. A similar conversion was made to the former East African D.C.A. Heron, 5Y-KVC, by Executive Air Engineering Ltd. at Baginton as N714R in 1969.

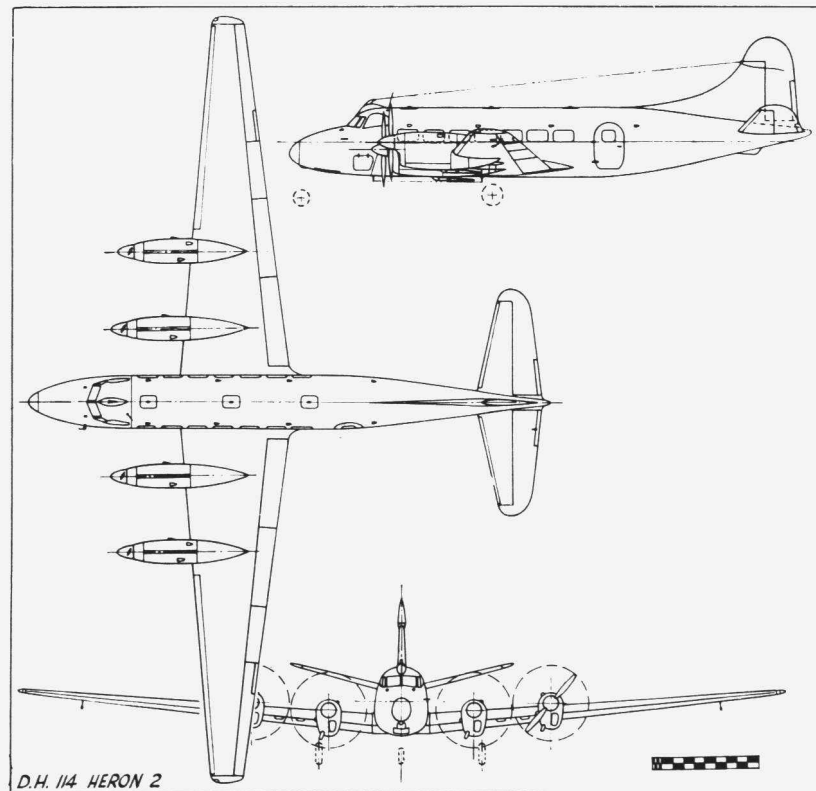
A more extensive remanufacture was undertaken by Saunders Aircraft Corp. Ltd. of Gimli, Manitoba who replaced the four Gipsy Queens by two 715 e.s.h.p. United Aircraft PT-6A-27 propeller-turbines. The first such



Saunders ST-27 8P-GWP was delivered to the Barbados charter airline, Tropic Air Services, early in 1976.

conversion, designated the ST-27, was made to the former British Joint Services Mission Heron 2, XG603, which first flew at Dorval as CF-YBM-X on May 18, 1969. Among a number of other surplus Herons sent to Canada for ST-27 conversion were the Queen's Flight aircraft XH375 and XM295, ferried in 1969 as CF-YAP and CF-XOK. These were delivered to Aerolineas Centrales de Colombia as ST-27s HK-1287 and to Skywest Canada as CF-XOK respectively early in 1972. The R.A.F.'s penultimate Heron, XR391, and the Kuwaiti 9K-BAA, followed as CF-CNT and 'NX', and after conversion were sold to Bayview Air Service, Slave Lake, and Otonabee Airways, Peterborough as C-FCNT and 'NX' respectively.

When supplies of used Herons dwindled, Saunders began the basic engineering for the ST-27B (later known as the ST-28), wholly built at Gimli with 783 e.s.h.p. PT-6A-34s, partial pressurisation and operating at the increased all-up weight of 14,500 lb. The prototype, C-FYBM-X, (actually a rebuild of Heron 14087, originally S.A.A.F. 121 and later G-ASUU) first flew at Gimli on July 17, 1974. All work terminated however after 12 ST-27s and the ST-28 prototype had been built, as shown in the production table.



D.H. 114 HERON 2

SPECIFICATION AND DATA

Manufacturers: The de Havilland Aircraft Co. Ltd., Hatfield Aerodrome, Herts. and Hawarden Aerodrome, Chester. Re-manufacturing programme as ST-27 series commenced 1969 by Saunders Aircraft Corp. Ltd., Gimli, Manitoba, Canada

Power Plants: (Prototype) Four 250 h.p. de Havilland Gipsy Queen 30
Four 330 h.p. de Havilland Gipsy Queen 30-3
Four 340 h.p. de Havilland Gipsy Queen 30-4
(All production marks)
Four 250 h.p. de Havilland Gipsy Queen 30 Mk. 2
(XB-ZIP) Four 340 h.p. Lycoming GSO-480-B1A6
(Riley) Four 260 h.p. Lycoming IO-540-G1A5
(ST-27) Two 715 e.s.h.p. United Aircraft PT-6A-27
(ST-28) Two 783 e.s.h.p. United Aircraft PT-6A-34

Dimensions: Span 71 ft. 6 in. Length 48 ft. 6 in.
Height 15 ft. 7 in. Wing area 499 sq. ft.

Weights and Performances:

	Mks. 1 and 2	Mks. 1B, 2B, 2C	Mks. 2D, 2E, 3 and 4
Tare weight	7,960 lb.	7,985 lb.	8,150 lb.
All-up weight	13,000 lb.*	13,000 lb.**	13,500 lb.***
Cruising speed	160 m.p.h.	165 m.p.h.	183 m.p.h.
Initial climb	1,200 ft./min.	1,060 ft./min.	1,140 ft./min.
Ceiling	18,500 ft.	18,500 ft.	18,500 ft.
Range	805 miles	805 miles	915 miles

* Prototype 12,500 lb. ** Heron 2C 13,150 lb.
*** XB-ZIP 14,450 lb.

Production:

(a) Hatfield-built Heron 1s

Constructor's Numbers	Aircraft markings
10903 14001-14007	Prototype G-ALZL ZK-AYV, LN-PSG, PP-SLF, 'LG, LN-SUD, G-AMUK, 'TS (Mk. 2 prototype)

(b) Chester-built Heron 1s

Constructor's Numbers	Aircraft markings
14008-14025	F-BGOH, G-AMSP, F-BGOI, ZK-BBM, 'BN, F-BGOJ, PK-GHA-'HC, G-AMYU, PK-GHD, CX-AOR, PK-GHE, F-BGXU, PK-GHG, 'HH, G-ANAX, CX-AOS
14026-14049	PK-GHI, 'HK-'HP, ZK-BBO, G-ANFE, 'LN, 'FF, 'FG, F-OANR, 'NS, 'PM-'PO, G-ANCI, 'XA, CX-AOU, 'OV, G-ANSZ, 'XB, 'NO
14081, 14099	G-ANWZ, G-AOFY

(c) Chester-built Heron 2s

Constructor's Numbers	Aircraft markings
14050-14080	SA-R5, ZS-DIG, G-ANOL, 'PA, LN-NPI, Congo C'GG, TC-HAK, 'AN, XG603, XH375, TC-HAT, 'ER, G-ANUO, TC-HIZ, 'AS, VT-DHD, TC-HUN, VT-DHE-'HI, VR-NAQ/XR443*, VT-DHK, G-ANVH, VT-DHJ, VR-NAV, 'AW, ZS-DLO, CR-IAA, G-ANYJ, G-ANCI, VR-NCB, CR-IAB, S.A.A.F. 120, VR-NCC, S.A.A.F. 121, VP-BAP, G-AODY, VR-NCD, VR-NCE/XR444*, VR-NCF/XR445*, LN-SUR, G-AOGC, 'GW, 'GO, 'GU, G-ANPV
14082-14098	G-AOHB, G-AORG/XR441*, G-AORH/XR442*, LN-BDS, G-AORI, Iraq 393, Iraq RF-5, G-AOTI, Luftwaffe CA+001, G-AOXZ, VP-KVC, VH-ASH, G-AOZX, EC-ANJ, I-BKET, EC-ANX-'NZ, G-APHW, N3999A, EC-AOA-'OC, 'OF, Luftwaffe CA+002, G-APEV
14100-14125	
14126-14148	Jordan H.105, H.106, G-APMV, XM295 (Mk. 3), XM296 (Mk. 3), YV-P-AEB, G-APSW, 9G-AAA, 'AB, Ceylon CR801, CR802, G-APXG, Ceylon CR803, CR804, G-AREC, XR391 (Mk. 4), Ghana 501, G-ARTI, Malaysian FM1054, FM1055, 5N-ABH, OY-AFO, G-AVTU

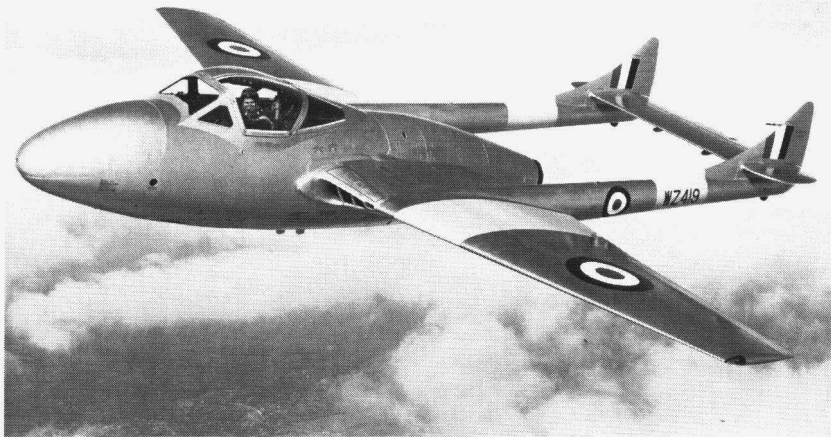
* Sea Heron C. Mk. 20.



The ST-28 prototype, C-FYBM-X, running up for first take-off at Gimli, Manitoba, July 17, 1974.

(d) Saunders conversions

(c/n ST-27-001/14058) XG603/OY-DNJ/CF-YBM-X/HK-1286 Aerolineas Centrales de Colombia; (002/14129) XM295/CF-XOK Skywest; (003/14050) SA-R5/G-APRK/PH-VLA/OY-DPN/OY-DGK/5N-AGM/CF-FZR/HK-1299 Aerolineas Centrales de Colombia; (004/14059) XH375/CF-YAP/HK-1287 Aerolineas Centrales de Colombia; (005/14087) S.A.A.F. 121/G-ASUU/C-FYBM-X ST-28 prototype; (006/14054) LN-NPI/LN-SUL/OY-ADV/G-AYLH/CF-LOL St. Andrews Airways; (007/14141) XR391/CF-CNT Bayview Air Service; (008/14137) G-APXG/9K-BAA/Kuwait 303/CF-CNX Otonabee Airways; (009/14095) G-AOGW/C-GCML Skywest; (010/14070) VT-DHH/VH-CLR/C-FFZP Otonabee Airways (011/14097) G-AOGU/D-CASI/OY-DPO/D-CAHA/C-FJFH; (012/14112) G-AOZX/C-FHMQ; (013/14051) ZS-DIG/G-AZSO/C-GCAT.



The Vampire Trainer development aircraft, *WZ419*, with the clear-view canopy, ejector seats, dorsal fairings and other modifications adopted in production from the 144th aircraft.

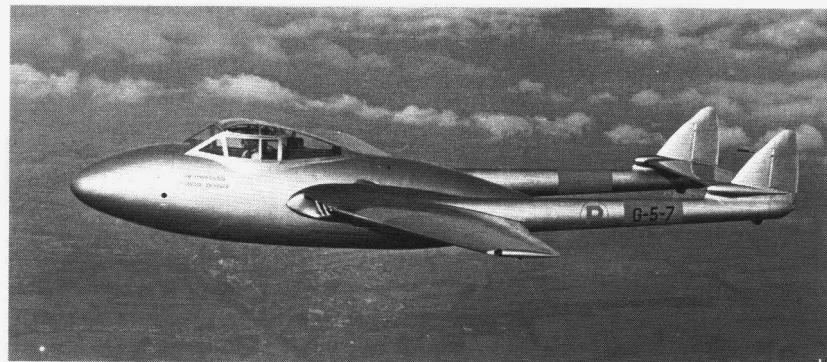
De Havilland D.H.115 Vampire Trainer

The removal of night interception equipment from the de Havilland D.H.113 and the fitting of dual controls to create a private venture jet trainer, was a logical step made in 1950. The prototype, *G-5-7*, known as the D.H.115 Vampire Trainer, was built in the Christchurch factory and statically exhibited at the Farnborough S.B.A.C. Show in September of that year but was not airborne until J. W. Wilson made the first 25 minute flight at Christchurch on November 15th. At the conclusion of company trials the prototype was handed over to the R.A.F. as *WW456* for Service evaluation, first at No. 204 Advanced Flying School and then at the Central Gunnery School, Leconfield. The programme was completed satisfactorily on April 26, 1951 and in September the aircraft performed at the Farnborough S.B.A.C. Show, afterwards being handed over to the Christchurch Technical School as a ground instructional airframe. In February 1952, the D.H.115 was adopted as the standard R.A.F. advanced trainer and ordered to Specification T.111 under the designation Vampire T. Mk. 11.

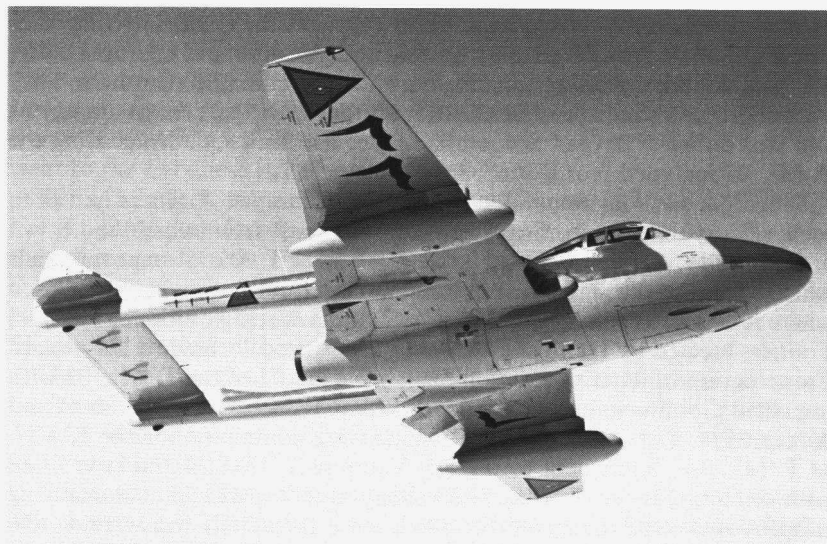
It marked the beginning of a new era in which R.A.F. pilots qualified for 'wings' on jet aircraft. Student pilots graduating from the Hunting Percival Provost were converted to a jet of fighter-like performance with side by side seating in a pressurised cabin. It was equipped with two 100 gallon underwing fuel tanks and could be used for fighter navigation, the demonstration of compressibility effects, or for combat training equipped

with dual inter-connected gunsights and two 20 mm. Hispano 404 cannons. For other armament training, provision was made for the carriage of eight 25 lb. rockets and eight 25 lb. practice bombs; or 500 lb. bombs with rockets; or two 1,000 lb. bombs.

Deliveries began with *WZ414*, first flown on January 19, 1952, and the first units to receive Vampire Trainers were Nos. 202 and 208 Advanced Flying Schools at Valley and Weston Zoyland; and the Fighter Weapons School, Leconfield. They were issued to No. 5 F.T.S. at Oakington in 1954 and two years later ousted the Balliol to become the first jet trainer used by

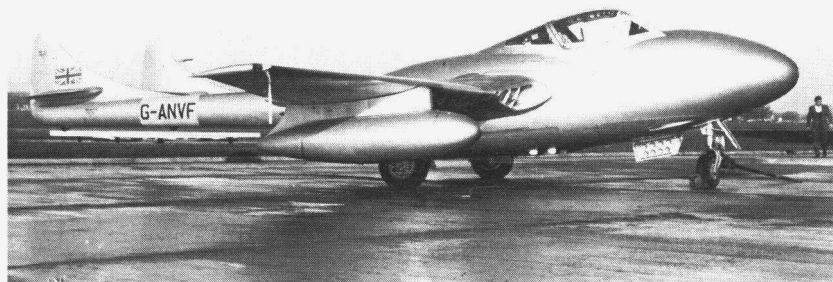


The prototype D.H.115 Vampire Trainer with the original tail assembly. (*De Havilland Photo.*)



D.H.115 Vampire T. Mk. 55, serial 333, delivered to the Royal Iraqi Air Force in April 1953. The dorsal fins and tailplane extension are clearly shown in this view.

(*De Havilland Photo.*)



Vampire T. Mk. 55 civil demonstrator *G-ANVF*, c/n 15485, showing the clear view canopy of late production models. (*De Havilland Photo.*)

the R.A.F. College, Cranwell. They were also issued to Fighter Squadrons as communications and check aircraft and to most Station Flights. Early operational experience showed the need for certain modifications for which *WZ419* formed the installation vehicle. They included a central blind flying panel; side by side ejector seats; a one piece, clear view canopy and long curving dorsal fins.

Before quantity production began, two pre-production Vampire Trainers, *WW458* and *WW461*, were also built at Christchurch, the first of which flew on December 1, 1951. Both were delivered to R.N.A.S. Culham early in 1952 for Royal Navy evaluation which resulted in the delivery of 73 Sea Vampire T. Mk. 22 aircraft, commencing *XA100* and ending *XG777*, for Fleet Air Arm training squadrons at Lossiemouth and elsewhere. They were also employed for communications duties with Sea Venom squadrons and as Admirals' Barges. Second line Fleet Air Arm squadrons using the T. Mk. 22 included Nos. 736, 738, 749, 764 and 781.

When production terminated in 1958, 804 Vampire Trainers had been built, 427 at the Chester factory, the first aircraft from which had flown in October 1951. They included large numbers of T. Mk. 55 export models which equipped the air forces of more than 20 countries, including Sweden where it was locally designated J28C and India where additional Vampire Trainers erected by Hindustan Aircraft Ltd. were allotted late *BY* serials. Construction of 41 examples commencing *A79-801* of the T. Mk. 33 with imported Goblin engines, was undertaken at Bankstown by de Havilland Aircraft Pty. Ltd., the last five of which were completed for the R.A.N. as T. Mk. 34s, equivalent to the Sea Vampire T. Mk. 22 and later fitted with ejector seats as T. Mk. 34As. Sixty-nine T. Mk. 35s commencing *A79-600* delivered in September 1957, were then built but whereas the T. Mk. 33 and 34 had the old type fins and canopy, the T. Mk. 35 had the later type and was fitted with increased tankage and non-skid hydraulic brakes. All T. Mk. 33s were then converted to this standard but retained



Line-up of Swiss-built Vampire T. Mk. 55s at Dubendorf Aerodrome.

their original fuel capacity and were designated T. Mk. 35As. They were used for night flying, instrument approaches and armament practice and British-built T. Mk. 11s served a similar purpose with No. 14 Squadron, R.N.Z.A.F. at Ohakea and with the Royal Rhodesian Air Force.

Three T. Mk. 55s were allotted British civil status for overseas delivery and demonstration; c/n 15485 as *G-ANVF* prior to handing over to the Finnish Air Force as *VT-1* in April 1955; c/n 15798 shipped to Buenos Aires as *G-AOXH* in November 1956 for a demonstration tour of South America by George Errington who handed it over to the Chilean Air Force on April 16, 1957; and c/n 15802 for which the marks *G-APFV* were reserved but which was an exhibit at the 1957 S.B.A.C. Show and went to the Lebanese Air Force as *L-160* instead.

By 1965 the R.A.F.'s only active Vampire Trainers were six kept at No. 1 F.T.S., Linton-on-Ouse, for training foreign students. In January 1966 they were transferred to No. 7 F.T.S., Church Fenton, and thence to No. 3 F.T.S. Leeming where their last operational sortie took place on November 29, 1967 when a Flight of four performed formation aerobatics, with a final flypast, led by one of the replacing Jet Provosts.

The R.A.F. disposed of a considerable number, often for nominal sums, to museums and A.T.C. Squadrons, while one aircraft in particular, *XD452*, was donated to de Havilland's own Mosquito Museum at Salisbury Hall in 1968.

A few remained in service with the Central Air Traffic Control School, Shawbury, until November 1970 and with No. 3 Civilian Anti-Aircraft Co-operation Unit at Exeter until the end of 1971. One of these, *XH304*, was spared and flown to Little Rissington to join a Gloster Meteor T. Mk. 7 which together formed the R.A.F.'s Vintage Pair which delighted

thousands of Air Show spectators annually until the duo were tragically destroyed when they collided over Mildenhall on May 25, 1986. This accident left the former Shawbury machine *G-VTII/WZ507*, rebuilt to flying condition in 1980, as the only airworthy Vampire Trainer in the U.K., though there were several flying with civil marks in the U.S.A., including a number of Australian built T.T.35s.

SPECIFICATION AND DATA

Manufacturers: The de Havilland Aircraft Co. Ltd., Hatfield Aerodrome, Herts., Christchurch Aerodrome, Hants. and Hawarden Aerodrome, Chester
The Fairey Aviation Co. Ltd., Ringway Aerodrome, Manchester
de Havilland Aircraft Pty. Ltd., Bankstown Aerodrome, Sydney, N.S.W.

Power Plant: One 3,500 lb. s.t. de Havilland Goblin 35

Dimensions: Span 38 ft. 0 in. Length 34 ft. 6½ in.
Height 6 ft. 2 in. Wing area 262 sq. ft.

Dimensions: Tare weight 7,380 lb. All-up weight 11,150 lb.

Performance: Maximum speed 538 m.p.h. at sea level
Initial climb 4,500 ft./min. Ceiling 40,000 ft. Range 840 miles

Production: Prototype, *G-5-7/WW456*; 2 pre-production, *WW458*, *WW461*; 528 T. Mk. 11 for the R.A.F., *WZ414-WZ430*, *WZ446-WZ478*, *WZ493-WZ521*, *WZ544-WZ593*, *WZ607-WZ620*, *XD375-XD405*, *XD424-XD463*, *XD506-XD554*, *XD588-XD627*, *XE816-XE833*, *XE849-XE897*, *XE919-XE961*, *XE975-XE998*, *XH264-XH278*, *XH292-XH330*, *XH357-XH368*, *XX582-590*, *XX623-XX637*; 6 T. Mk. 11 for the Royal Navy, *XJ771-XJ776* (frustrated Norwegian order, c/n 15016, '18, '27, '28, '33, '51); 73 T. Mk. 22 for the Royal Navy, *XA100-XA131*, *XA152-XA172*, *XG742-XG749*, *XG766-XG777*.

Export Orders:

Australia: 35 T. Mk. 33, *A79-801* to *A79-835* for the R.A.A.F.; 5 T. Mk. 34, *A79-837* to *A79-841* for the R.A.N.; 69 T. Mk. 35 built by de Havilland Aircraft Pty. Ltd., Bankstown, *A79-600* to *A79-668*; 4 T. Mk. 22 diverted from Royal Navy contract. R.A.N. type serial N6 allotted 1964

Austria: 8 T. Mk. 55, *5C-YA* (c/n 15770/*G-5-12*, crashed in Snowdonia, replaced by *5C-YA* (*XD598*), *5C-YB* (15795/*G-5-13*), *5C-YC* (15797/*G-5-14*), *5C-YR*, *5C-YS*, *5C-VD* (*WZ618*), *5C-VE* (*XX634*), *5C-VF* (*XH320*)

Burma: 8 T. Mk. 55, *UB501* to *UB508*

Ceylon: 5 T. Mk. 55, *CF-501* to *CF-505*, shipped 1951 but returned to Hatfield without being unpacked

Chile: 5 T. Mk. 55, *J-01* (15798/*G-AOXH*) to *J-05*; 6 surplus Royal Navy T. Mk. 22

Egypt: 12 T. Mk. 55, *1570* (15721) to *1581*

Finland: 9 T. Mk. 55, *VT-1* (15485/*G-ANVF*) to *VT-9*

India: 53 T. Mk. 55, *BY377* to *BY386*, *IY467* to *IY470*, *IY514* to *IY552*; 60 T. Mk. 55 built by Hindustan Aeronautics, Kanpur

Indonesia: 8 T. Mk. 55, *J701* (15729) to *J708*

Iraq: 7 T. Mk. 55, *333* to *335*, *367*, *386* to *388*

Ireland: 6 T. Mk. 55, *185* (15764) to *187*, *191* to *193*, *198* (*XE977*, ground instructional airframe)

Japan: 1 T. Mk. 55, *63-5571* (15758)

Jordan: 3 T. Mk. 11, *T209* (15516/*XD548*), *T210* (15518/*XD552*), *213* (15137/*WZ545*)

Lebanon: 4 T. Mk. 55, *L-151*, *L-153*, *L-159*, *L-160* (15802/*G-APFV*)

New Zealand: 6 T. Mk. 55, *NZ5701* to *NZ5706*; 5 T. Mk. 11, *NZ5707* (15579/*XH265*), *NZ5708* (15580/*XH266*), *NZ5709* (15679/*XH271*), *NZ5710* (15691/*XH317*), *NZ5711* (15761/*XH366*)

Norway: 6 T. Mk. 55, *PX-E*, *PX-C*, *PX-M*, *ZK-X*, *ZK-Y*, *ZK-E*
Portugal: 2 T. Mk. 55, *5801*, *5802*

South Africa: 27 T. Mk. 55, *221* to *226*, *257* to *277*

S. Rhodesia: 8 T. Mk. 11, *SR116* (15370/*XE816*) to *SR123*; 4 T. Mk. 11 ex R.A.F. *XH268* to *XH271*

Sweden: 45 T. Mk. 55 (Swedish designation J28C), *28411* to *28455*

Syria: 2 T. Mk. 55, *493* (15768), *494* (not delivered 1956 due to arms embargo, scrapped at Hatfield 1960)

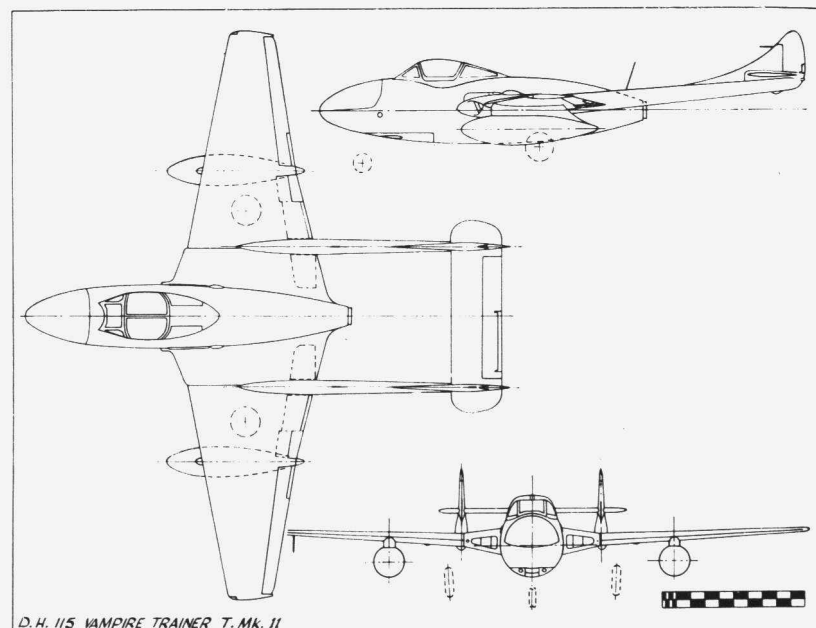
Switzerland: T. Mk. 55s commencing *U-1001*, licence-built using British-made fuselages; T. Mk. 11s, ex R.A.F., by road for the Swiss Air Force, e.g. *U-1238* (15263/*XD439*)

Venezuela: 6 T. Mk. 55, *23-A-36* (reserialled *1E-35*), *2E-35* to *6E-35*

Service Use:

Royal Air Force: Nos. 1, 3, 4, 5, 7 and 8 F.T.S.; C.F.S., Little Rissington; E.T.P.S., Farnborough; A. & A.E.E., Boscombe Down; R.A.F. College, Cranwell; Nos. 202 and 208 A.F.S.; No. 2 A.N.S.; No. 233 O.C.U., Pembrey; No. 229 O.C.U., Chivenor; Central Gunnery and Fighter Weapons Schools, Leconfield; Central Navigation and (later Air Traffic) Control School, Shawbury; Armament Practice Schools at Acklington and Sylt; No. 3 C.A.A.C.U., Exeter

Royal Navy: No. 738 Sqn., Brawdy; Nos. 759 and 763 Sqn., Lossiemouth; Airwork Ltd., Yeovilton



D.H. 115 VAMPIRE TRAINER T. MK. 11



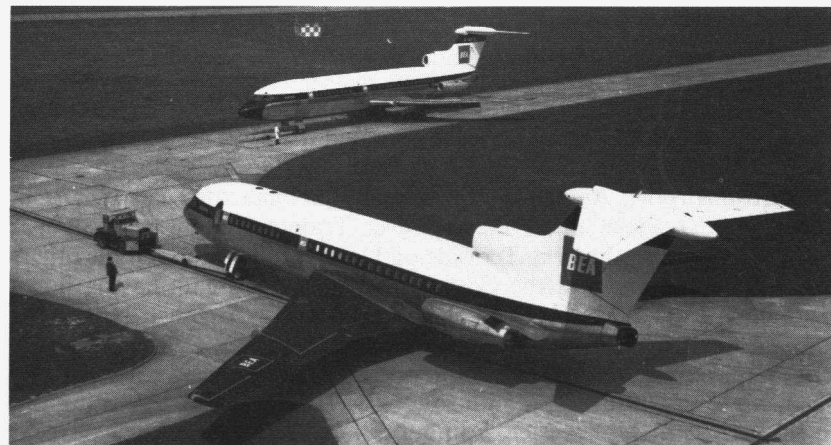
The prototype Trident making its first flight, January 9, 1962. Flown by chief test pilot John Cunningham, with co-pilot Peter Buggé and three other crew members, it was airborne 81 minutes. (*De Havilland Photo.*)

De Havilland D.H.121 Trident

In August 1956 British European Airways Corporation issued a specification for a 600 m.p.h. shorthaul turbojet transport to operate from 2,000 yard runways and suit its own particular route network. Several prominent manufacturers submitted keenly competitive proposals but the de Havilland D.H.121 design offered a combination of speed and economy not hitherto approached on short route stages, and an announcement made in the House of Commons on February 12, 1958 stated that it had been chosen on technical merit. Confidence in the manufacturers of the Comet was such that no prototype was ordered and the aircraft went into quantity production straight from the drawing board following the signing of a contract on August 12, 1959 for 24 aircraft with an option on a further 12. In accordance with one of British European Airways Corporation's main stipulations, the three Rolls-Royce Spey by-pass engines were grouped at the tail to minimise cabin noise, an arrangement adopted by the French Sud-Est concern, builders of Vampires and Sea Venoms under licence, for its Comet-nosed Caravelle.

The D.H.121 design team was led by C. T. Wilkins and construction was initially the responsibility of a consortium formed by the de Havilland, Fairey and Hunting companies under the revived name of The Aircraft Manufacturing Co. Ltd. Following the inclusion of de Havillands into the Hawker Siddeley Group however, the D.H.121 became entirely a D.H. project and Airco was disbanded. With its distinctive plan form and 35 degrees of wing sweepback, the D.H.121 obviously owed much to the celebrated Comet 4 but was far more efficient aerodynamically because the mainplane had a cleanliness only possible with rear mounted engines. Also the main undercarriage legs carrying four wheels each, pivoted about the rear spar and turned through 90 degrees before folding inwards so that the wheels were housed in the fuselage and not inside the wing when retracted. The nose wheel was offset to port to retract sideways. For lateral control split ailerons were fitted, only the inner portions of which were used at high Mach numbers, and double slotted flaps worked in conjunction with leading edge slats. To ensure complete safety the powered controls were operated by three completely separate hydraulic circuits, a distinctive feature which, combined with the three engined layout, led to the adoption of Trident as an appropriate type name in September 1960.

In typical mixed class configuration, 75 passengers sat 4-6 abreast while for coach class working the 66 ft. 10 in. long pressurised cabin accommodated 97 passengers six abreast. All fuel was carried in the wing and to ensure rapid turn round a high landing weight in relation to maximum take off weight enabled more than one stage to be flown without refuelling. The Trident could land within 40 minutes of a full load take off, having covered 180 miles with still enough fuel for 700 miles in its tanks. The aircraft was also unique in satisfying the Corporation's demand for automatic landing and the entire fleet was equipped with 'autoflare' with full automatic



The first and second production Tridents G-ARPA and G-ARPB at Hatfield in May 1962 (*De Havilland photo.*)



G-ARPF, in the final livery used by B.E.A. before the merger with B.O.A.C. to form British Airways, landing at Heathrow on August 14, 1970 (Tony Leigh photo.)

landing capability added later through Smith's Flight Control System.

By the end of 1959 preliminary structural testing had begun and a fuselage nose section had been subjected to water tank pressure testing. The first D.H.121 was rolled out at Hatfield on August 4, 1961 and by September taxiing trials had been completed with two ground running engines installed and the airframe systems had been checked. The Spey turbojet was airborne for the first time on October 12th in an Avro Vulcan XA902, a test bed in which Speys were tested under Trident flight conditions prior to the first flight of the prototype early in 1962. The next six aircraft joined the flight test programme later in 1962 to ensure the issue of a full C. of A. in time for first deliveries to be made to B.E.A.C. by mid 1963.

Only 23 of the initial order for 24 Tridents actually entered service because the penultimate aircraft, *G-ARPY*, crashed at Felthorpe, Norfolk during its maiden flight on June 3, 1966 as the result of a deep stall, with the loss of test pilots Peter Barlow, George Errington and two other crew.

In 1974 *G-ARPU* was withdrawn from use and later scrapped at Heathrow. In the following year a further seven machines *G-ARPA*, 'PB', 'PE', 'PF', 'PG', 'PJ' and 'PM' were flown to Prestwick where they were broken up, the majority in 1976. The remaining eleven Trident 1s, however, had much longer lives, being employed, mainly on domestic services until the early 1980s. *G-ARPD* and *G-ARPR* operated their last services in March and April 1981 respectively and were later flown to Teesside, for use by the British Airports Authority Fire School. The same fate befell *G-ARPW* and *G-ARPO* which made the last ever Trident 1 flight when it was delivered from Heathrow to Teesside on December 12, 1983. Of the others *G-ARPH* is preserved at the Cosford Aerospace Museum having flown there on April 2 1982; *G-ARPY* flew to Perth on November 29, 1982 to join Air Service Training as an instructional airframe; *G-ARPP* became a fire service trainer at Glasgow after operating its last service in February 1983, while the following month saw *G-ARPK*, 'PL', and 'PN' being put to similar use at Manchester, Edinburgh and Aberdeen respectively; *G-ARPZ*, the machine which flew the last British Airways Trident 1 service from Glasgow to Heathrow on April 2 1983, was sold to RFD Ltd. and

delivered to Dunsfold on April 7 where in 1987 it was still being used in trials of the company's safety equipment.

The developments of the initial design, the 140 seat Hawker Siddeley HS.121 Trident 1E, the long span 2E and the enlarged, high capacity, 3B are outside the scope of this book which is devoted to de Havilland history.

SPECIFICATION AND DATA

Manufacturers: The de Havilland Aircraft Co. Ltd., Hatfield Aerodrome, Herts.

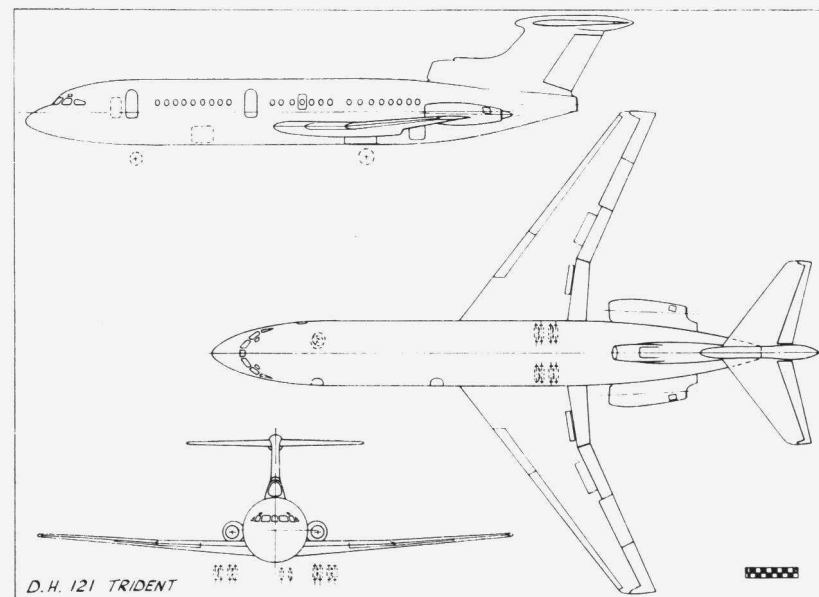
Power Plants: Three 10,400 lb. s.t. Rolls-Royce R.B.163-1 Spey

Dimensions: Span 89 ft. 10 in. Length 114 ft. 9 in.
Height 27 ft. 0 in. Wing area 1,358 sq. ft.

Weights: Basic operational weight 63,200 lb.
Maximum take off weight 107,000 lb.
Maximum landing weight 102,000 lb.

Performance: Best cost cruise 508 knots at 32,000 ft. at 100,000 lb.
Range with maximum payload 1,530 nautical miles
Range with maximum fuel 2,350 nautical miles

Initial Production 1962-1966; (c/n 2101-2124) *G-ARPA* to *G-ARPU*; *G-ARPW* to *G-ARPZ*. *G-ARPB* retained by Hawker Siddeley Aviation Ltd., for Autoland Trials 7.64 to 1.67; *G-ARPC* withdrawn from use after cabin fire at Heathrow 28.12.75; *G-ARPI* crashed at Staines shortly after take-off from Heathrow on 18.6.72 with the loss of 118 lives; *G-ARPS* withdrawn from use after cabin fire at Heathrow 29.7.69; *G-ARPT* destroyed at Heathrow 3.7.68 by crashing Airspeed Ambassador 2 *G-AMAD*; *G-ARPY* crashed at Felthorpe, Norfolk 3.6.66





The D.H.125 North American demonstrator, G-ASSI, flying near Hatfield in 1964.
(De Havilland Photo.)

De Havilland D.H.125

The D.H.125 was the jet successor to the Dove executive transport, fitted in the modern manner with two rear mounted Bristol Siddeley Viper 20 turbojets and T tail. At the time of its initial announcement in February 1961 a wooden mock up was already complete and on April 6th it was stated that an initial batch of 30 was being laid down for delivery in 1963. The D.H.125 was fully pressurised and air conditioned for the carriage of two crew, six passengers in large executive armchairs, and generous baggage at a cruising speed of 450–500 m.p.h. over stages up to 1,500 miles. The fuselage and cabin was cylindrical but a foot wider than that of the Dove in order to give the same headroom as the Heron and the one piece mainplane had large double slotted flaps and air brakes. The D.H.125 was designed to operate from short runways, employ moderate approach speeds and operate at a cost per mile closely approximating that of the Dove.

It was designed by a de Havilland team led by J. Goodwin and for a short time was known as the Jet Dragon. An initial batch of 30 Series 1 aircraft was laid down in the Chester factory but two prototypes, slightly shorter in span and length, were built in the experimental shop at Hatfield. The first, G-ARYA, made its first flight of 56 minutes on August 13, 1962 piloted by C. A. Capper and the second, 'YB, followed on December 12th. These were used for the certification programme and in the autumn of 1964 the 8th production aircraft, G-ASSI, made an extensive sales tour of the U.S.A. and Canada which ensured a steady market in North America for more than a decade.

The subsequent development and commercial history of de Havilland's 'mini jetliner' took place after the firm was absorbed into the Hawker Siddeley Group and is therefore outside the scope of this book. It is noteworthy, however, that so great was the impact made by the de Havilland name in North America that it was deemed good sales technique for several years to describe the American model as the D.H.125 rather than the H.S.125.

SPECIFICATION AND DATA

Manufacturers: The de Havilland Aircraft Co. Ltd., Hatfield Aerodrome, Herts. and Hawarden Aerodrome, Chester (style changed to Hawker Siddeley Aviation Ltd. in 1964).

Power Plants: (Prototypes) Two 3,000 lb. s.t. Bristol Siddeley Viper 20
(Series 1) Two 3,000 lb. s.t. Bristol Siddeley Viper 520

Dimensions: (Prototypes) Span 44 ft. 0 in. Length 43 ft. 6 in.
Height 14 ft. 0 in. Wing area 342 sq. ft.
(Series 1) Span 47 ft. 0 in. Length 47 ft. 5 in.
Height 16 ft. 6 in. Wing area 353 sq. ft.

Weights: (Prototypes) Tare weight 8,500 lb. All-up weight 19,000 lb.
(Series 1) Tare weight 9,768 lb. All-up weight 20,000 lb.

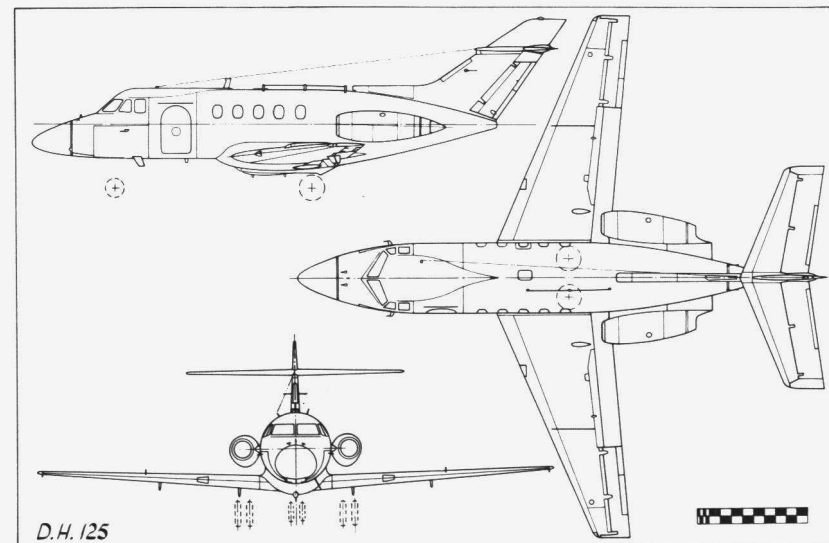
Performance: (Series 1) Maximum cruise 484 m.p.h.
Economical cruise 420 m.p.h.
Maximum range 2,000 miles

Initial Production

25001–25002
25003–25008
25009
25010

Prototypes
Series 1
Series 1B
Series 1

G-ARYA, G-ARYB
G-ARYC, 'SEC, 'SNU, HB-VAG, G-ASTY, 'SSI
G-ATPC
G-ASSM



De Havilland Projects

Illustrated by side view line drawings (with half-scale front views), from the Company's archives.

D.H.7 FIGHTER

A partially completed design for a single seat tractor fighter powered by one Rolls-Royce Falcon engine. The scheme was abandoned due to the non-availability of engines.

D.H.8 C.O.W. GUN FIGHTER

A projected pusher aircraft mounting a heavy calibre Coventry Ordnance Works 1½ pounder gun. The design was not completed because engines were not available and also through development problems with the gun which, with its mounting, lay in the experimental shop at Hendon for most of 1917.

D.H.12 DAY BOMBER

A modified version of the D.H.11 Oxford which only reached the design stage and was never built. Motive power was again to have been provided by two 320 h.p. A.B.C. Dragonfly radial engines, but the mid-upper gunner was moved to a new position between the spars of the upper mainplane to give him an improved field of fire.

D.H.13

Type number not used.



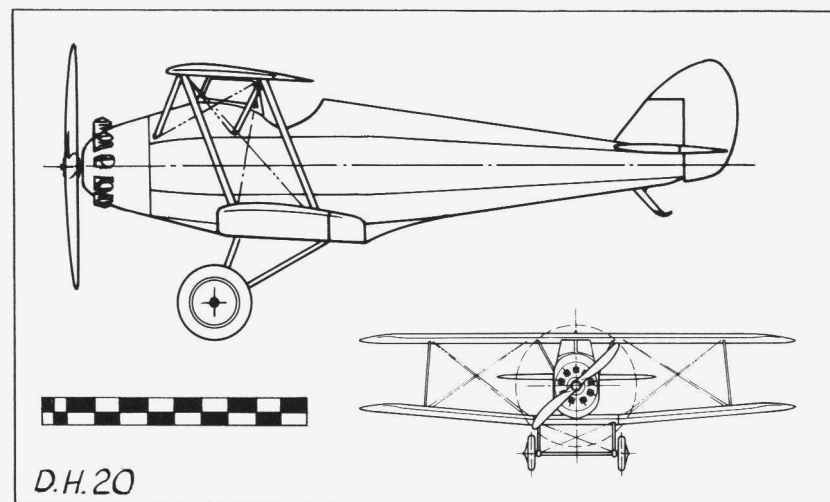
An artist's impression of the projected D.H.17 with two 600 h.p. Rolls-Royce Condor engines. ('Flight' Drawing 1396.)

D.H.17 PASSENGER TRANSPORT

An ambitious design for a large biplane carrying two crew and sixteen passengers, fitted with a semi-retractable undercarriage and powered by two 600 h.p. Rolls-Royce Condor engines. Although considerable design work was completed and brochures were distributed all over the world, no orders were received owing to the financial retrenchment which followed the postwar slump of 1920-21 and construction did not take place. Span 82 ft. 0 in. Length 63 ft. 6 in. Wing area 1,650 sq. ft.

D.H.19 TWO SEAT CABIN TOURER

This was to have been a two-seat cabin biplane powered by one 275 h.p. Rolls-Royce Falcon III but the design was not completed.



D.H.20 SPORTING BIPLANE

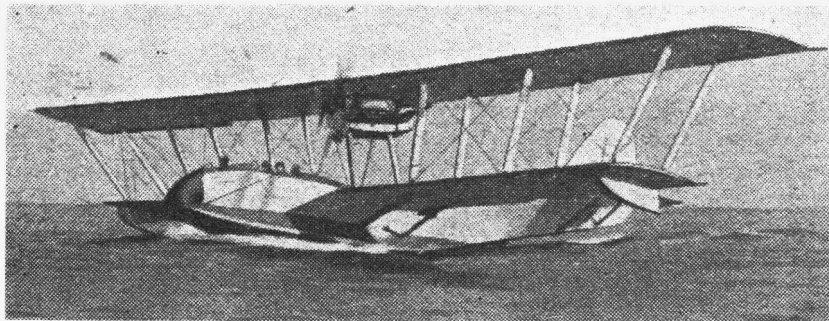
Layout prepared for the Aircraft Manufacturing Co. Ltd. by Geoffrey de Havilland for a single seat sporting biplane with folding wings, powered by an A.B.C. Wasp seven cylinder radial engine, and somewhat resembling the B.A.T. Bantam or Austin Whippet. Span 33 ft. 0 in. Length 26 ft. 0 in. Wing area 330 sq. ft.

D.H.21 HEAVY TRANSPORT

A design study for the Aircraft Manufacturing Co. Ltd. for a heavy civil transport with two engines geared to one airscrew.

D.H.22 PUSHER BIPLANE

Layout for a pusher biplane with normal rear fuselage in place of outriggers, the motor being mounted on the upper mainplane.



An artists impression of the Napier Lion engined D.H.23 four seat flying boat project.

D.H.23 FLYING BOAT

A four seat biplane flying boat powered by one 450 h.p. Napier Lion mounted under the top centre section and driving a tractor airscrew. It is evident that design work on this flying boat came nearer to completion than any in the projected D.H.19 to D.H.25 series, as application was made to the Air Ministry for civil registration and the marking *G-EARN* was allocated to the D.H.23, constructor's number E.58, on March 9, 1920.

D.H.24 CABIN BIPLANE

Layout for a larger, developed version of the D.H.18 cabin transport, powered by a Napier Lion.

D.H.25 PASSENGER TRANSPORT

Layout for a large transport biplane accommodating ten passengers and two crew. Power was to have been supplied by three 400 h.p. Liberty 12 watercooled engines housed in the fuselage, two side-by-side and the third aft, all geared to one airscrew. Span 86 ft. 0 in. Length 63 ft. 0 in. Fuel 810 gallons. Oil 30 gallons. All-up weight 15,440 lb.

D.H.26 COMMERCIAL MONOPLANE

Prior to 1912 the monoplane configuration had been widely used by pioneer aircraft constructors, but in that year structural failure caused a number of fatalities which resulted in an ill considered ban on such machines. For nearly ten years there was considerable prejudice in favour of the biplane and although a few monoplanes were built, strength limitations of available materials nearly always resulted in their being heavily strut or wire braced.

In 1920 Capt. de Havilland not only broke with tradition by designing a monoplane to carry a commercial load of 1,000 lb. but went a stage further by incorporating a thick section, internally braced, cantilever wing. With the specified engine, a 230 h.p. Siddeley Puma, this aircraft, designated the D.H.26, showed such promise that the Air Council placed an order for two

examples of a larger version, the D.H.29, fitted with the 450 h.p. Napier Lion. The D.H.26 design was not therefore proceeded with.

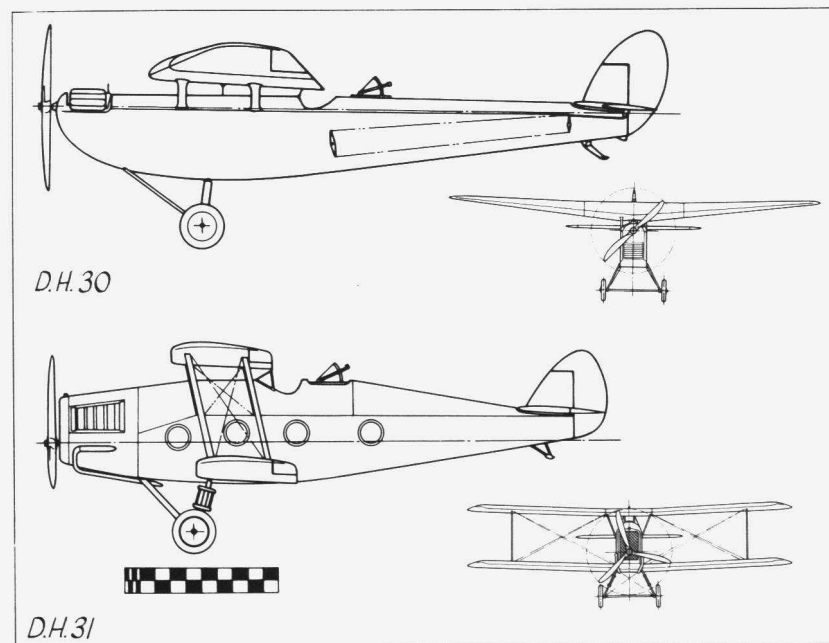
D.H.28 TROOP CARRIER

A design for a troop carrier biplane to Air Ministry D. of R. Type 12 which did not go beyond the layout stage. Power would have been supplied by a 1,000 h.p. Napier Cub, the main fuel tanks for which were sited on top of the fuselage. A crew of two sat in an open cockpit ahead of a cabin 23 ft. 0 in. long. The fuselage lines of the D.H.28 were similar to those of the D.H.54 of 1924. Span 87 ft. 0 in. Length 65 ft. 0 in.

D.H.30 RECONNAISSANCE MONOPLANE

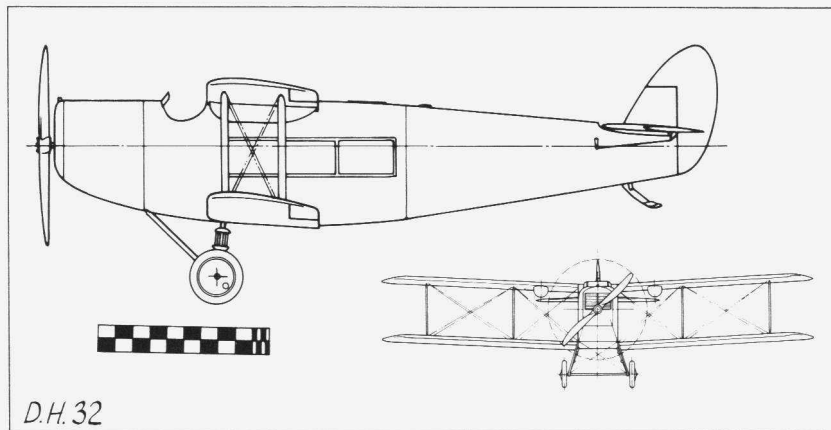
Design study for a high-wing reconnaissance aircraft to Air Ministry Specification D. of R. Type 3. It was derived from the D.H.29 but the pilot's cockpit was sited amidships as in the D.H.18 and the thick section, cantilever mainplane (which housed a 120 gallon fuel tank) was raised above the fuselage on short centre section struts. An observer sat in a small cabin ahead of the bomb stowage and a gunner's cockpit with Scarff mounted Vickers gun defended the tail.

There is some evidence to suggest that an aircraft which had been allotted the type name Denbigh and referred to in official records, was a fighter reconnaissance version of the D.H.30 to Specification D. of R. Type 3A. Span 48 ft. 6 in. Length 41 ft. 0 in.



D.H.31 RECONNAISSANCE BIPLANE

The layout for a reconnaissance biplane to Air Ministry Specification D. of R. Type 3, powered by a 450 h.p. Napier Lion (or similar) engine, with pilot and gunner seated high up over a sizeable cabin featuring four circular windows in each side and reminiscent of the Avro Bison. Stowage for three 112 lb. bombs was provided in the centre of the cabin with a walkway on each side, giving the rear gunner access to the radio and camera positions forward. Span 42 ft. 0 in. Length 36 ft. 9 in.



D.H.32 PASSENGER TRANSPORT

The very considerable technical and commercial success of the D.H.18 led to two investigations into the possibility of building an even better aeroplane of the same general type to meet Air Ministry Specification 18/21. The first, although little more than a layout, was allotted the de Havilland type number D.H.24, but the second, known as the D.H.32, was a full design study. It retained all the features which had contributed to the success of the D.H.18, including the plywood covered fuselage, oleo damped and independently sprung undercarriage, controlled engine cooling and detachable power plant, but in the light of experience with the D.H.29, refinements such as ball bearing controls and differential ailerons were added. To reduce operating costs below those of the earlier machines, and to take full economic advantage of the aerodynamically refined D.H.32 airframe, the faithful 450 h.p. Napier Lion was forsaken for a special commercial version of the Rolls-Royce Eagle rated at 360 h.p.

Airline service inevitably revealed a number of shortcomings in the D.H.18 and as a result, all eight seats in the D.H.32 faced forward, four on each side of a central gangway. The cabin door was on the starboard instead of the port side and the main baggage compartment was situated in the rear fuselage. Provision was also made for an elementary form of air

conditioning which, in conjunction with large D.H.29-style sliding windows, was intended to reduce the possibility of air sickness. To this end petrol fumes were banished from the cabin and fire risks reduced by attaching the fuel tanks to the underside of the upper mainplanes.

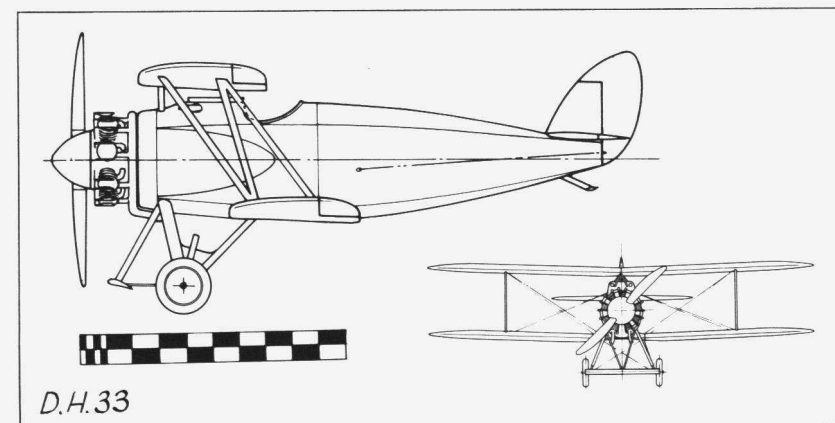
In bad weather and without wireless, pilot-navigation had proved difficult and even hazardous, with the result that the D.H.32 was designed for operation by a crew of two which included a navigator. As on the D.H.29, they were afforded a magnificent view in all directions by moving the open cockpit to a position forward of and on a level with, the upper mainplanes.

In September 1921 it was announced that construction of the first D.H.32 was about to begin at Stag Lane and considerable interest was shown by the D.H.18 operators Instone Air Line Ltd. and Daimler Hire Ltd., then in urgent need of new equipment. As their existing fleets were Lion powered, this well tried engine was stipulated for the new machines. The very promising D.H.32 design was therefore shelved in favour of a Lion powered version of higher aspect ratio, carrying nine passengers at a higher cruising speed. This was the world famous D.H.34.

SPECIFICATION AND DATA

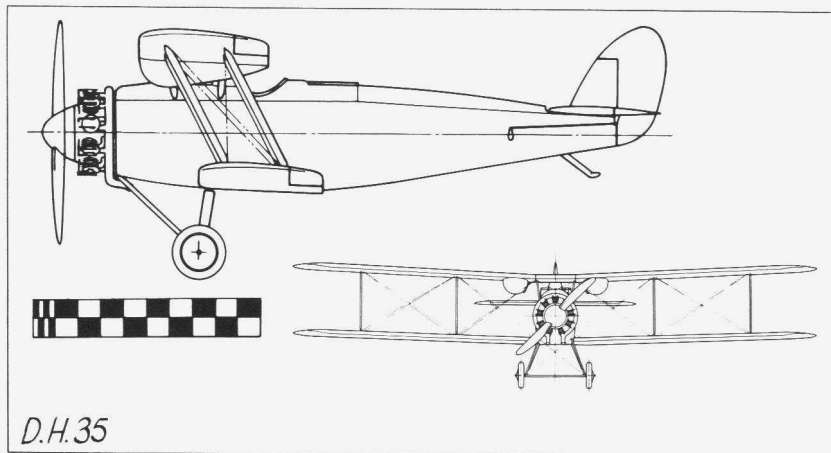
<i>Designers:</i>	The de Havilland Aircraft Co. Ltd., Stag Lane Aerodrome, Edgware, Middlesex	
<i>Power Plant:</i>	One 360 h.p. Rolls-Royce Eagle	
<i>Dimensions:</i>	Span 50 ft. 0 in.	Length 39 ft. 0 in.
	Height 14 ft. 0 in.	Wing area 618 sq. ft.
<i>*Weights:</i>	Tare weight 3,412 lb.	All-up weight 5,738 lb.
<i>*Performance:</i>	Maximum speed 110 m.p.h.	Cruising speed 98 m.p.h.
	Climb to 10,000 ft. 27½ min.	Ceiling 14,000 ft.
	Duration 4 hours	

* Estimated.



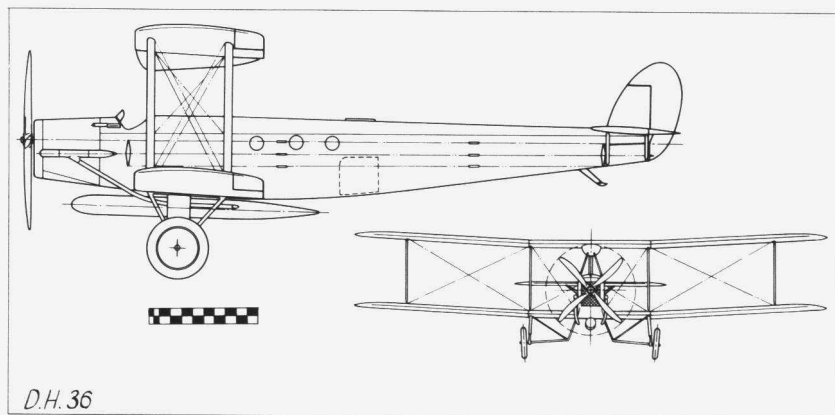
D.H.33 FLEET FIGHTER

Layout for a single seat ship's fighter to Air Ministry Specification D. of R. Type 6. The design envisaged a small, heavily staggered biplane with radial engine and high-camber hydrovane mounted forward of the main undercarriage for alighting on water. The rear fuselage was detachable behind the pilot's cockpit for ease of stowage aboard ship. Span 29 ft. 0 in. Length 23 ft. 0 in.



D.H.35 CORPS RECONNAISSANCE BIPLANE

A design for a Corps Reconnaissance biplane to Air Ministry Specification D. of R. Type 3A which did not go beyond the layout stage. The aircraft was to have been a two seater, somewhat resembling the Armstrong Whitworth Atlas and powered by an Armstrong Siddeley Jaguar aircooled radial engine. Span 46 ft. 0 in. Length 27 ft. 6 in.



D.H.36 TORPEDO BOMBER

A design for a coastal defence torpedo bomber to Air Ministry Specification D. of R. Type 9 which did not go beyond the layout stage. It would have been similar to the D.H.27 Derby in appearance but with centre section struts instead of the cabane. The crew of three consisted of a pilot forward of the wings, a gunner on top of the rear fuselage and a bomb aimer in the bottom of the centre fuselage, all three positions being connected by a walkway. Span 86 ft. 0 in. Length 61 ft. 0 in.

D.H.38 GENERAL PURPOSE BIPLANE

This was a military biplane offered in either general duties or bombing versions, powered by one 450 h.p. Napier Lion engine with buried radiator and similar in physical size and appearance to the D.H.14A. In the bomber version the bomb sight was fitted in the floor of the pilot's cockpit and had a range from 45 degrees forward to vertically downwards. The gunner's position, sited close behind the pilot, was equipped with a Scarff ring. Small bombs were carried under the pilot's seat as in the D.H.14, with the larger ones in racks under the lower mainplane. Designs and performance calculations were prepared for the Greek Government for a long range heavy bomber, a short range bomber with increased bomb load and a long range photographic reconnaissance machine. No order was placed and the D.H.38 was not built.

SPECIFICATION AND DATA

Designers: The de Havilland Aircraft Co. Ltd., Stag Lane Aerodrome, Edgware, Middlesex

Power Plant: One 450 h.p. Napier Lion V

Dimensions: Span 51 ft. 3 in. Length 35 ft. 6 in.

Estimated Weights and Performance:

	Long range bomber	Short range bomber	Reconnaissance
Military load . . .	660 lb.	2,870 lb.	660 lb.
Speed at 1,000 ft. . .	113 m.p.h.	113 m.p.h.	125 m.p.h.
Climb to 10,000 ft. . .	22 min.	22 min.	10 min.
Ceiling	13,000 ft.	24,800 ft.	—
Range	1,000 miles	370 miles	—

D.H.39 GREEK BOMBER

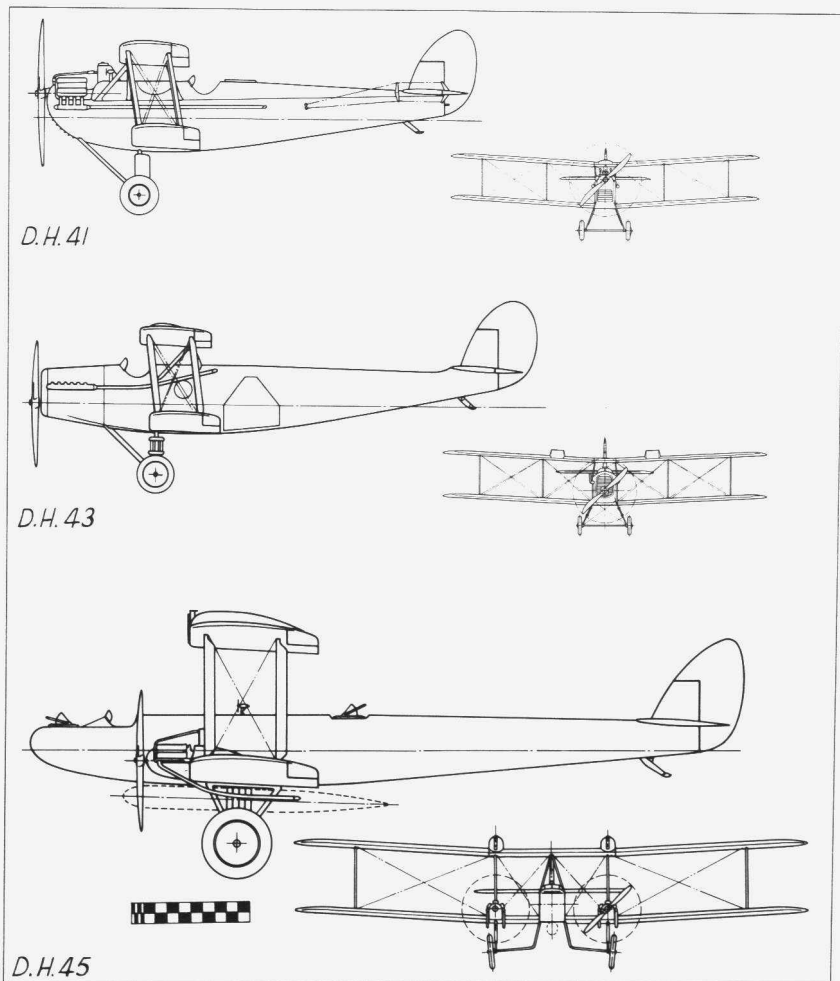
An alternative version of the D.H.38 fitted with one 360 h.p. Rolls-Royce Eagle VIII engine. A layout was prepared for the Greek Government but there were no detail designs and no order was placed. Span 51 ft. 3 in. Length 35 ft. 6 in.

D.H.40 CANADIAN FORESTRY PATROL BIPLANE

A projected two seat forestry patrol version of the D.H.39 for civil operation by the Canadian Air Board. Engine and dimensions as for the D.H.39.

D.H.41 RECONNAISSANCE BIPLANE

A two seat reconnaissance version of the D.H.38 to Air Ministry Specification D. of R. Type 3. Power was to have been supplied by one 450 h.p. Napier Lion but the aircraft did not go beyond the layout stage and no order was placed. Span 51 ft. 3 in. Length 36 ft. 6 in.



D.H.43 FREIGHTER

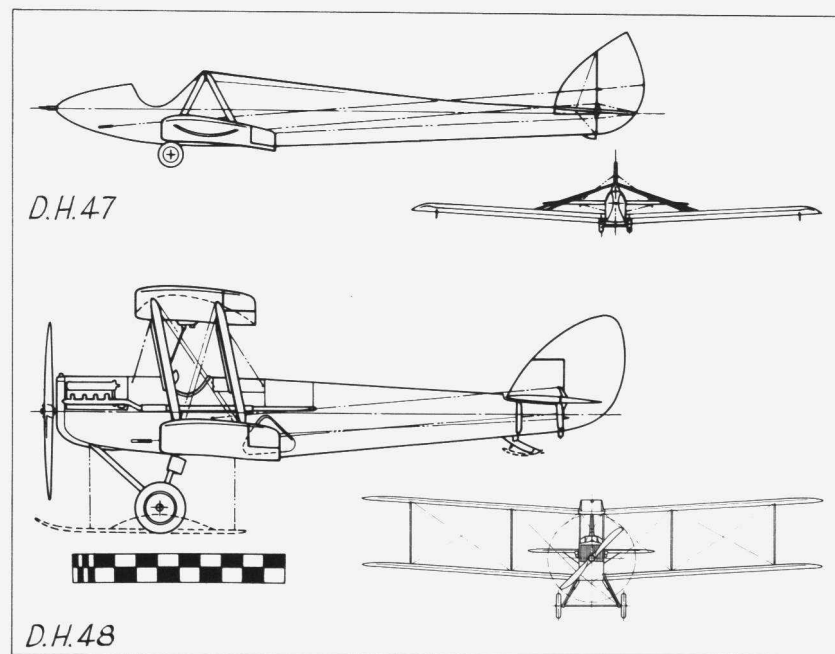
A layout for a large freight carrying biplane powered by one 400 h.p. Liberty 12 watercooled engine. The pilot sat in an open cockpit ahead of the wings with a small cabin behind and below him for his loader/ground engineer. The fuselage provided 15 ft. of unobstructed cargo space and was equipped with a large freight door on the port side. Gravity tanks on the top wing and variable incidence tailplane were standard de Havilland features. There was no detail design and the aircraft was not built.

D.H.44 CIVIL TRANSPORT

A preliminary design study made in 1923 for a civil transport with Siddeley Puma engine. Not proceeded with.

D.H.45 TORPEDO BOMBER

A twin engined, torpedo carrying coastal defence aircraft powered by two 450 h.p. Napier Lion engines. Somewhat resembling the D.H.11, it was intended to carry a crew of three comprising pilot, front gunner/bomb aimer and rear gunner. Layout only, no detail design. Span 86 ft. 0 in. Length 60 ft. 0 in.



D.H.46 ULTRA LIGHT MONOPLANE

A layout for a single seat sporting monoplane somewhat resembling the later D.H.53 Humming Bird but there was no detail design and the aircraft was not built. Span 37 ft. 6 in. Length 24 ft. 2 in.

D.H.47 GLIDER

This was a single seat, low-wing glider, otherwise similar in general outline to the later D.H.52 but there was no detail design and the aircraft did not go beyond the layout stage. Span 38 ft. 0 in. Length 27 ft. 1 in. Wheel track 2 ft. 6 in.

D.H.48 CANADIAN FORESTRY PATROL BIPLANE

This was a layout for a single seat survey and forestry patrol aircraft for the Royal Canadian Air Force. It bore a marked resemblance to a Lion powered D.H.9A but was in fact to have been fitted with a 200 h.p. Wolseley Viper engine. The fuselage was designed for the carriage of specialist equipment and was divided into compartments of the correct size and shape for the storage of furs, snow shoes, survival equipment, cameras, W/T apparatus and luggage. There was no detail design and the aircraft was not built. Span 37 ft. 0 in. Length 25 ft. 6 in.

D.H.49 RECONNAISSANCE BOMBER

The D.H.49 was to have been a modernised version of the D.H.9A with plywood covered fuselage, oleo damped undercarriage, differential ailerons, ball bearing controls and cantilever tail unit. In these respects therefore it was identical with the D.H.9AJ Stag. Particular attention was paid to low speed controllability and the 370 h.p. Rolls-Royce Eagle IX watercooled engine, driving a four bladed airscrew, was specified as standard. Provision was also made for the alternative installation of the 400 h.p. Liberty 12 or the 450 h.p. Napier Lion. Reconnaissance, bombing and General Purpose variants were also offered. An Air Ministry 'D' Notice of 1924, giving particulars of new types transferred to the Open List, shows the Stag as having a Napier Lion. It was not fitted with this engine but with it the Stag would have been almost identical with this version of the D.H.49.

Estimated Weights and Performances:

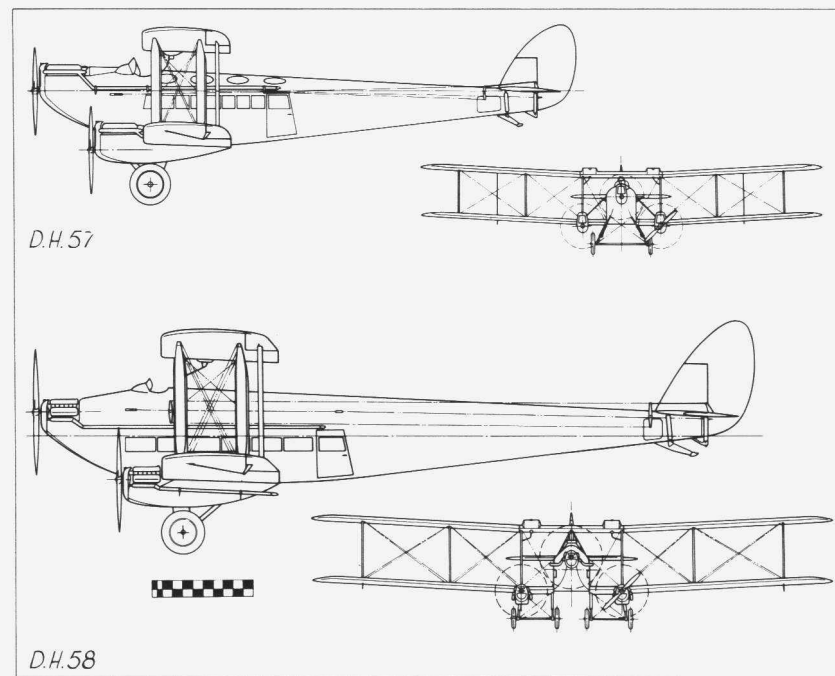
	Reconnaissance	Bombing
Tare weight . . .	—	2,900 lb.
All-up weight . . .	4,200 lb.	5,500 lb.
Military load . . .	308 lb.	1,340 lb.
Maximum speed . . .	134 m.p.h.	115 m.p.h.
Climb to 10,000 ft. . .	12 min.	30 min.
Endurance . . .	3½ hours	—

D.H.55 CIVIL TRANSPORT

A layout for a seven passenger transport biplane based on the D.H.54 Highclere and powered by three 120 h.p. Airdisco aircooled engines. There was no detail design and the aircraft was not built.

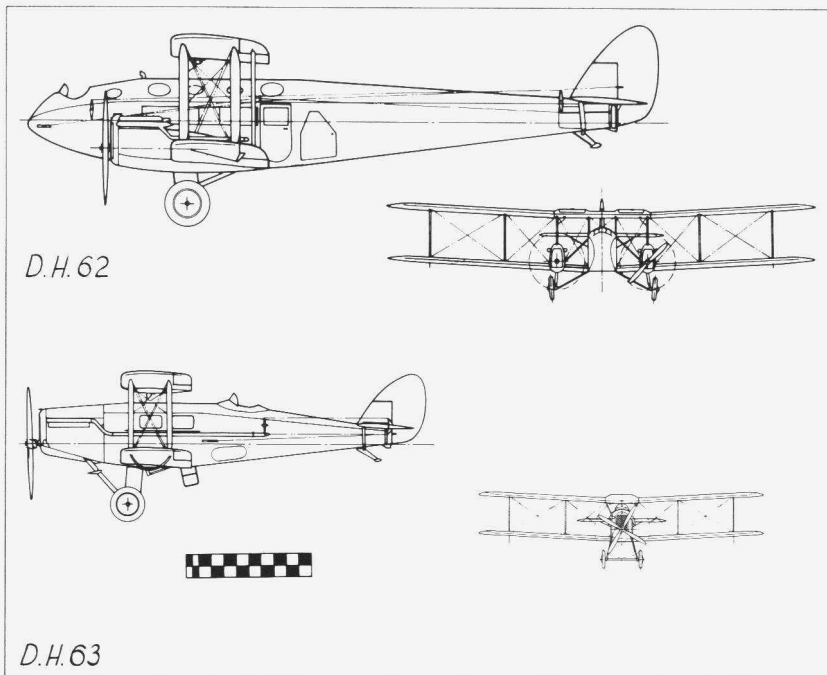
D.H.57 CIVIL TRANSPORT

A twelve passenger, 2 crew, version of the D.H.55 powered by three 230 h.p. Siddeley Puma engines. The D.H.57 would have resembled the D.H.54 Highclere with wing motors mounted on the lower mainplanes outboard of the undercarriage. Span 79 ft. 0 in. Length 53 ft. 6 in. Wing area 1,280 sq. ft. All-up weight 11,500 lb.



D.H.58 AND D.H.59 TRANSPORT BIPLANES

These type numbers were allotted to schemes for transport aircraft which were not proceeded with. The D.H.58 is known to have been an investigation for a scaled up version of the D.H.57 for 20 passengers and 2 crew, powered by three 450 h.p. Napier Lion engines, one in the nose and two in underslung nacelles on the lower mainplane. Span 103 ft. 0 in. Length 68 ft. 6 in. Wing area 2,150 sq. ft. All-up weight 21,500 lb.



D.H.62 EIGHT PASSENGER BIPLANE

This was a design study for an eight passenger transport aircraft with large single fin and rudder, powered by two 240 h.p. Siddeley Puma in-line watercooled engines. These engines were mounted on the lower mainplane, protruding forward in the manner of the D.H.89 Rapide nacelles of a decade later. An open cockpit for two crew occupied the nose, cabin glazing was similar to that of the D.H.61, and fuel was carried in two 78 gallon tanks. There were no detail drawings and the aircraft was not built. Span 68 ft. 0 in. Length 50 ft. 6 in.

D.H.63 AIR TAXI

The designation D.H.63 was allotted to a scheme for a scaled down version of the D.H.61, seating four passengers in a cabin ahead of the pilot. A single 240 h.p. Siddeley Puma with nose radiator would have given the projected aircraft a distinct family resemblance to the D.H.14. There were no detail drawings and the D.H.63 was not proceeded with. Span 45 ft. 0 in. Length 31 ft. 2 in.

D.H.64 TRANSPORT BIPLANE

A further transport investigation, made in September 1926 for an enlarged 14 passenger version of the D.H.62 powered by two Armstrong

Siddeley Jaguar radial aircooled engines of unspecified mark. Span 77 ft. 0 in. Length 54 ft. 9 in. Wing area 1,200 sq. ft. All-up weight 11,500 lb. Payload 2,900 lb.

D.H.68 EXECUTIVE BIPLANE

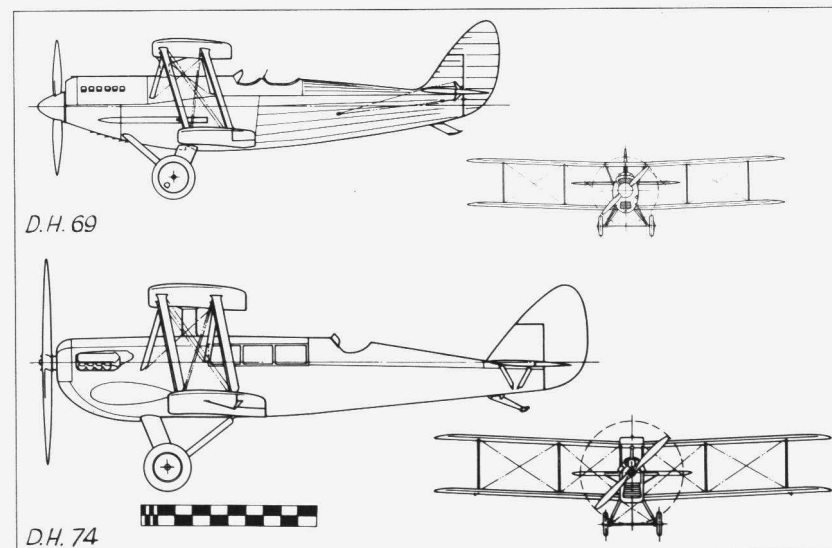
This type number was allotted to a preliminary investigation for an executive version of the D.H.67. The cabin had accommodation for six passengers with toilet facilities and two crew sat side by side in an open cockpit in the nose. The engines were two Armstrong Siddeley Jaguar two row aircooled radials of unspecified mark. There were no detail drawings and the aircraft was not built. Span 58 ft. 6 in. Length 39 ft. 6 in. Wing area 845 sq. ft. All-up weight 7,500 lb.

D.H.69 DAY BOMBER

A design study in connection with an Air Ministry specification for a high performance day bomber. The layout resembled that of the D.H.65A Hound, aerodynamically improved and powered by a Rolls-Royce Falcon Mk. X watercooled supercharged engine driving a two bladed Fairey-Reed metal airscrew. A crew of two occupied open tandem cockpits with forward firing guns for the pilot and a prone bombing position in the floor of the fuselage. Span 36 ft. 0 in. Length 26 ft. 6 in.

D.H.70 ARMY CO-OPERATION BIPLANE

Type number allotted to a layout for an Army Co-Operation biplane for the Australian Government. Not proceeded with.



D.H.73 HIGH ALTITUDE SURVEY BIPLANE

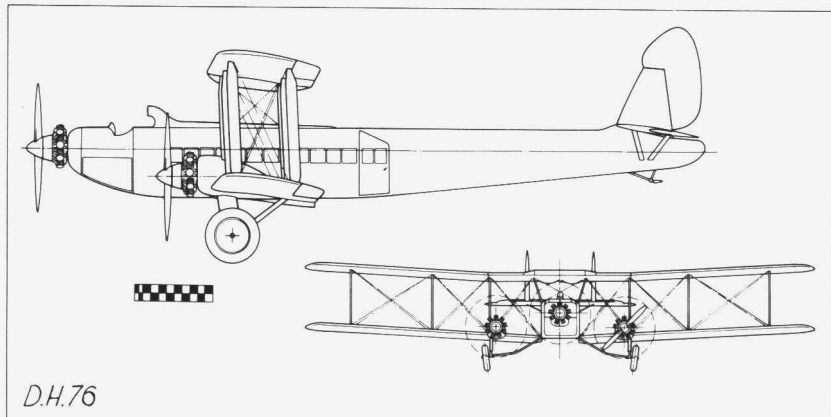
A specialised development of the D.H.67 design for high altitude survey work, a layout for which was drawn up in March 1927. It would have been powered by two 300 h.p. A.D.C. Nimbus watercooled in-line engines with frontal radiators, housed in nacelles on the lower mainplane in a manner reminiscent of the D.H.10A. The scheme included a thickened lower centre section, ailerons on the lower wing only and twin vertical tail surfaces. There was also an optional cockpit layout offering either side by side or tandem seating as in the D.H.67 and D.H.67B. There were no detail drawings and the aircraft was not built. Span 51 ft. 0 in. Length (landplane) 33 ft. 2 in., (seaplane) 38 ft. 9 in. Height 12 ft. 6 in. Wing area 620 sq. ft. All-up weight (landplane) 5,470 lb., (seaplane) 6,100 lb.

D.H.74 FOUR PASSENGER HOUND DEVELOPMENT

This was a preliminary study for a D.H.50 replacement based on the D.H.65A Hound. Somewhat larger than the D.H.50, it carried pilot and four passengers but no engine type was specified and the design was not proceeded with.

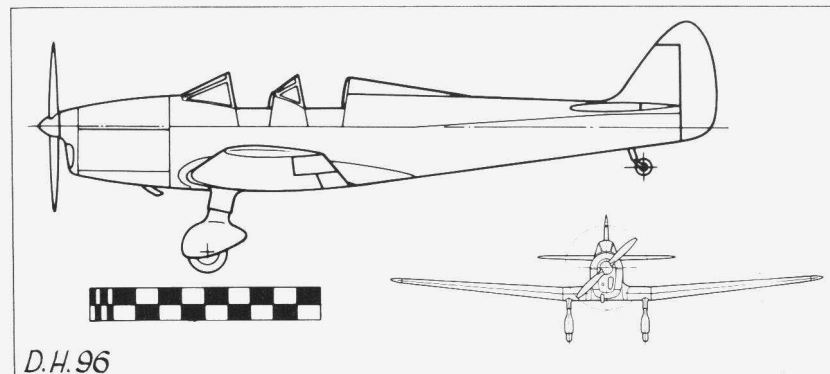
D.H.76 TWENTY PASSENGER AIRLINER

A D.H.66 replacement scheme using three Bristol Jupiter geared engines. Twenty passengers were to be carried in a spacious cabin in seven pairs of seats along the starboard side and six singles along the port. A luggage hold of 30 cu. ft. capacity was situated under the pilot's cockpit. There were no detail drawings and no dimensions or weights were finalised.



D.H.78 AND D.H.79 TRANSPORTS

These were alternative schemes for multi-motor transport aircraft and were not proceeded with.



D.H.96 LOW-WING TRAINER

This was a layout made in 1938 for a twin engined transport aeroplane based on the D.H.91 Albatross. There were no detail drawings and the type number was transferred to a two seat, low-wing monoplane to Air Ministry Specification T.1/37 and similar to the Miles Magister.

D.H.97 DESIGN STUDY

This was the last of the prewar transport design studies and was not proceeded with.

D.H.99 TWIN SABRE BOMBER

This type number covered proposals made to the Ministry of Aircraft Production in November 1941 for a scaled-up Mosquito night bomber with two high altitude Napier Sabre N.S.8SM engines cruising at 300 m.p.h. and having a range of 2,200 miles and operating at 27,000 ft. with a bomb load of 18,000 lb. Development was envisaged with Sabre N.S.19 SIM two-stage, three speed engines driving 15 ft. diameter contra-rotating airscrews to increase the full load cruise to 328 m.p.h. at 32,000 ft.

In December 1941 the twin Sabre project was renamed D.H.101 and D.H.99 was re-allotted to designs for a light, twin engined civil aircraft which J. P. Smith and the Moth Minor team had been working on at the outbreak of war, and which, due to military commitments, did not materialise.

D.H.101 TWIN SABRE BOMBER

The twin Napier Sabre bomber proposals, formerly designated D.H.99, were renumbered D.H.101 in December 1941. Air Ministry Specification B.11/41 was written round them but on April 4, 1942 de Havillands were informed that Sabre engines would not be available and that Rolls-Royce Griffons should be considered. In view of the expected reduction in performance with these engines, the project was immediately terminated.

D.H.102 MOSQUITO REPLACEMENT

This layout was similar to the projected D.H.101 but envisaged a lower powered night bomber to Specification B.4/42. Referred to as the Mosquito replacement, it was to have been fitted with two Rolls-Royce Griffon or Merlin engines and carry a 5,000 lb. bomb load at a lower speed than its namesake. Construction began, but work ceased in December 1942 when de Havillands became preoccupied with the D.H.103 Hornet.

D.H.105 PRIMARY TRAINER

The type number D.H.105 was allotted in 1946 to designs for a three seat, low wing, primary trainer with fixed undercarriage and bubble canopy to Specification T.23/43. The production contract for this trainer was awarded to the Percival Prentice and the D.H.105 was not built and so did not succeed the famous Tiger Moth as had been hoped.

D.H.116 SEA VENOM DEVELOPMENT

This was a design study aimed at modernising the Sea Venom all-weather fighter for the Fleet Air Arm. To speed up delivery by minimising new construction, the basic Venom fuselage was to have been slightly modified to house more modern radar and mated to a new thin section swept wing.

Although a development contract was signed for two prototypes, naval policy changed in favour of a larger twin engined aircraft and the D.H.116 was shelved in favour of the D.H.110, eventually adopted as the Sea Vixen.

D.H.118 LONG HAUL JET TRANSPORT

A specification issued by British Overseas Airways Corporation in October 1956 for a long haul turbojet transport for service in 1962 gave rise to design studies by several major aircraft manufacturers. The de Havilland proposals were given the type number D.H.118 and envisaged a 120 seater powered by four 17,000 lb. s.t. Rolls-Royce Conway engines. It was to be capable of nonstop Transatlantic flights at an all-up weight of the order of 240,000 lb. and also be faster and bigger than the Comets and have a superior performance to the Boeing 707. An important feature of the design was its ability to operate from existing runways. According to data given in Parliamentary debate in November 1956, B.O.A.C. were thinking in terms of 25-30 D.H.118s at a cost of some £56 million, but in February 1957 an official announcement stated that the project had been dropped.

D.H.119 AND D.H.120 SECOND GENERATION JET TRANSPORTS

These type numbers were allotted in 1956 to a series of design studies for a second generation turbojet transport. The D.H.119 with four Rolls-Royce Avons was an attempt to satisfy the requirements of British

European Airways Corporation and the D.H.120 was a probe into the possibility of meeting B.E.A.C. and B.O.A.C. requirements with one aeroplane.

D.H.122 TRIDENT VARIANT

A projected variant of the D.H.121 Trident to compete with the Vickers VC10.

D.H.123 PROPELLER TURBINE DAKOTA REPLACEMENT

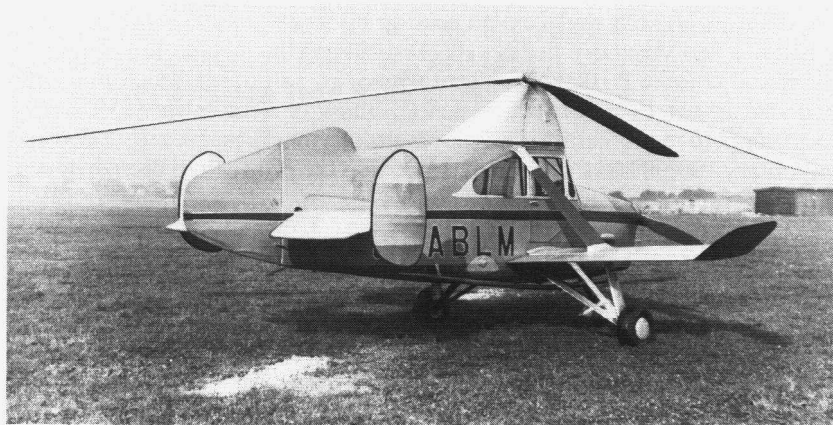
A series of design studies were made under this designation early in 1959 for a Heron/Dakota replacement seating up to 36 passengers. One study which reached the active project stage envisaged the installation of two de Havilland Gnome P.1000 propeller-turbines and although brochures were available at the Farnborough S.B.A.C. Show in September 1959 it was decided not to manufacture until the results of a market survey were known. In January 1961 an announcement stated that the project had been dropped in favour of the D.H.126.

D.H.126 TURBOFAN DAKOTA REPLACEMENT

This project was basically similar to the D.H.125 with two rear mounted turbofan engines, but enlarged to supersede the projected D.H.123 as an ultra-short-haul Dakota replacement. Designed to carry 35-50 passengers over distances up to 600 miles, it was studied by Airlines of New South Wales for routes in New Guinea, Papua and Queensland, and by United Arab Airlines for Middle East services in 1964.

The Cierva C.24 Autogiro

The de Havilland Aircraft Co. Ltd. was entirely responsible for the design and construction of this rotary wing aircraft, the Cierva Autogiro Company's sole contribution being the rotor assemblies. It thus found a place in the standard de Havilland constructor's number sequence as the last aircraft in a miscellaneous batch which included a D.H.66 Hercules, a D.H.9J and five D.H.75 Hawk Moths.



The de Havilland-built Cierva C.24 cabin autogiro, *G-ABLM*, ready for its first flight at Stag Lane, September 1931. ('Flight' Photo 11002.)

A two seat cabin autogiro of similar construction to the de Havilland D.H.80A Puss Moth, fitted with tricycle undercarriage and the three bladed rotor of the Cierva C.19 Mk. IV autogiro. One aircraft only *G-ABLM*, c/n 710, powered by one 120 h.p. de Havilland Gipsy III, built at Stag Lane and first flown by Senor Juan de la Cierva in September 1931. After trials at both Stag Lane and Hanworth, C. of A. was issued April 23, 1932. Toured Europe piloted by Cierva in the following May-June and flew in the Brooklands-Newcastle Race at 103.5 m.p.h. piloted by R. A. C. Brie on August 6, 1932. Shown at the Fifty Years of Flying Exhibition at Hendon in July 1951. Thereafter stored by the London Science Museum without engine, latterly at Hayes, Middlesex. Restored for static exhibition by Hawker Siddeley apprentices at Hatfield 1973-74, complete with engine but with parts of the rotor drive missing, for eventual transfer to the de Havilland Mosquito Museum, Salisbury Hall.

Rotor diameter 34 ft. 0 in. Length 20 ft. 0 in. Tare weight 1,280 lb. All-up weight 1,800 lb. Maximum speed 115 m.p.h. Cruising speed 100 m.p.h. Range 350 miles. Rotor speed 200 r.p.m.

Aircraft Designed by the de Havilland Aeronautical Technical School

As outlined earlier in this book, students of the de Havilland Technical School not only built D.H.9J, Gipsy Moth and Tiger Moth aircraft as practical exercises but also constructed light aeroplanes of their own design. In each instance students submitted their own ideas and the finished product embodied a combination of the best features.

The designation T.K. derived from the title "Tekniese Kollege No. 1" applied by Juste van Hattum, the Dutch student responsible for the drawings of their first aircraft. When the Second World War brought the series to an end, four aircraft of widely differing types had been built, the last of which was numbered T.K.5. The T.K.3 remained only a project but it may have had some influence on the design of the D.W.1 low-wing, single seat ultra light monoplane built at Hungerford, Berks. by former de Havilland Aeronautical Technical School students the Hon. Andrew Dalrymple and A. R. Ward in 1937.

T.K.6, caught in the design stage at the outbreak of war, would have been similar to an enlarged T.K.2 with a span of 34 ft. 0 in., length 22 ft. 0 in., fixed undercarriage and one 140 h.p. de Havilland Gipsy Major II driving a v.p. airscrew.

The T.K.2, completed against time for the 1935 King's Cup Race, bore a normal registration but in the case of the other three aircraft, officialdom was persuaded to unbend sufficiently to allot civil markings appropriately ending in 'TK'.

T. K. 1

A wooden two seater, *G-ACTK*, c/n 1, one 120 h.p. de Havilland Gipsy III, first flown at Stag Lane by Hubert Broad on November 14, 1933 as *E-3*. Fifth in the King's Cup Race 13-14.7.34 at 124.24 m.p.h. piloted by Geoffrey de Havilland Jnr. Sold to F/Lt. E. H. Fielden, Hendon, February 1936 and thereafter flown as a single seater until scrapped later that year. Span 27 ft. 0 in. Length 24 ft. 0 in. Wing area 183½ sq. ft. Tare wt. 944 lb. A.U.W. 1,450 lb. Max. speed 118 m.p.h. Cruise 100 m.p.h. Initial climb 900 ft./min. See photograph overleaf.



(R. P. Howard.)

T.K.2

A single seat, long range racer *G-ADNO*, c/n 1998, completed at Hatfield 1935 and powered by one 147 h.p. de Havilland Gipsy Major h.c. First flown August 16, 1935 as *E-3*, won the 1937 Heston-Cardiff race at 161.4 m.p.h. piloted by Geoffrey de Havilland Jnr. Modified and test flown as *E-5* in 1938 with span reduced to 28 ft. 0 in. and 140 h.p. de Havilland Gipsy Major II. Won the 1938 Heston-Cardiff race at 187.5 m.p.h. with the same pilot. Flown on the firm's wartime communications as *E-0235*. With Gipsy Major 10, broke the 100 km. closed circuit class record at 178.3 m.p.h. piloted by W. P. I. Fillingham August 31, 1947. Scrapped 12.47. Original span 32 ft. 0 in. Length 22 ft. 5 in. Wing area 125 sq. ft. Tare wt. 1,049 lb. A.U.W. 1,600 lb. Max speed 182 m.p.h. Initial climb 1,150 ft./min. (With 28 ft. 0 in. span) Wing area 119 sq. ft. Tare wt. 1,140 lb. A.U.W. 1,650 lb.



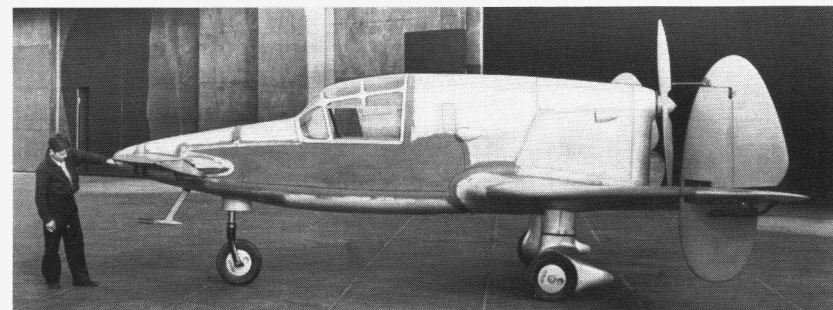
(A. J. Jackson Photo.)



(*'Flight'* Photo 15992.)

T.K.4

Built at Hatfield 1937 as the smallest single seat racer that could be designed around a 140 h.p. de Havilland Gipsy Major II. Equipped with retractable undercarriage, v.p. airscrew, slots and flaps. Registered *G-AETK*, c/n 2265, first flown July 1937 as *E-4*. Ninth in King's Cup Race September 11, 1937 at 230.5 m.p.h. piloted by R. J. Waight who was killed when the aircraft crashed near Hatfield October 1, 1937 during practice for an attempt on the 100 km. class record. Span 19 ft. 8 in. Length 15 ft. 6 in. Tare wt. 931 lb. A.U.W. 1,357 lb. Designed max. speed 215 m.p.h. Initial climb 1,350 ft./min.



(*'The Aeroplane'* Photo.)

T.K.5

Single seat canard research aircraft, *G-AFTK*, c/n 2266, built at Hatfield 1938-39 and powered by one 145 h.p. de Havilland Gipsy Major 1C driving a pusher airscrew. Completed late in 1939 and tested by Geoffrey de Havilland Jnr. but refused to leave the ground and was scrapped. Span 25 ft. 8 in. Length 18 ft. 3 in. Wing area 117 sq. ft. A.U.W. 1,366 lb. (Estimated) Max speed 177 m.p.h. Initial climb 1,165 ft./min. Ceiling 22,100 ft.

Aircraft Designed by de Havilland Aircraft Pty. Ltd.

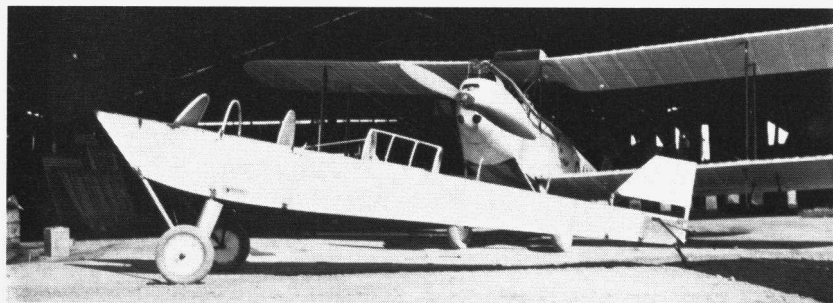
The de Havilland company started up in Australia early in 1927 when Maj. Hereward de Havilland took a D.H.60 Moth, *G-EBPP*, by sea to Perth and flew it to Melbourne where he rented a shed at the back of the town to assemble imported Moths. On March 7th of that year, less than seven years after the move to Stag Lane, an Australian subsidiary, de Havilland Aircraft Pty Ltd., was incorporated and became the first of a world-wide chain of overseas holdings.

Initially D.H.60 Moth, D.H.60G Gipsy Moth and D.H.60M Moth airframes were imported for erection and sale but even before the arrival of *G-EBPP*, kits of parts (as opposed to dismantled airframes) for three Cirrus engined D.H.60s had been supplied to QANTAS and completed (without constructor's numbers) as *G-AUFJ* for its own flying school at Longreach, and as *G-AUFI* and 'FK' for the West Australian Airways school at Perth W.A.

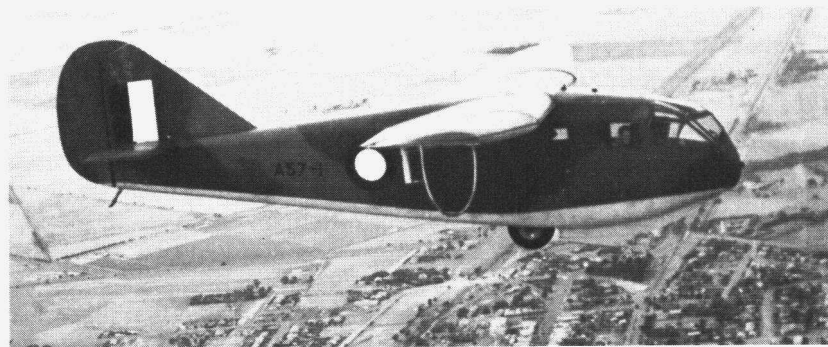
Later the de Havilland Aircraft Pty. Ltd. undertook limited manufacture of D.H.60G and D.H.60M Moths at Bankstown, Sydney and in 1941 some 41 D.H.94 Moth Minors were completed from components and materials shipped from Hatfield as described in the main text. Australian production thereafter amounted to—

D.H.82A Tiger Moth	1,085	D.H.98 Mosquito	212
D.H.83 Fox Moth	2	D.H.100 Vampire	80
D.H.84 Dragon	87	D.H.115 Vampire Trainer	73

In addition to the above, the company was also responsible for the design and construction at Bankstown Aerodrome, Sydney of the G.2 wartime troop carrying glider and the three-engined Drover postwar transport aeroplane.



The first Moths in Australia. *G-AUFI*, 'FJ' and 'FK' under construction at Longreach in 1926 from kits supplied by Stag Lane. (QANTAS.)



The first production D.H.A. G.2, *A57-1*, over Laverton in 1948.

D.H.A. G.2

All wood, seven seat troop carrying glider built in 1942 to R.A.A.F. Specification 5/42, using the D.H.84 Dragon nose section. Prototypes *G.1 EG-1/A57-1001* and *G.2 EG-2/A57-1002* had 60 ft. straight tapered wings. Six production D.H.A. G.2 aircraft *A57-1003* to *A57-1008* had slightly larger fuselages and 50 ft. 6 in. three piece wings. No others built due to Waco Hadrian availability. Production gliders renumbered later as *A57-1* to *A57-6*. *A57-1* flown at Laverton in October 1948 with Griffith suction wing operated by a Ford V8 engine in the fuselage. Length 33 ft. 0 in. Wing area 332 sq. ft. Tare wt. 1,450 lb. A.U.W. 3,250 lb. Towing speed 130 m.p.h.



Fiji Airways' Drover 2, *VQ-FAP*, on inter-island services in 1954.

D.H.A.3 DROVER

Utility transport for 8 passengers, resembling the D.H.104 Dove but with fixed undercarriage and three 145 h.p. Gipsy Major 10 Mk. 2 and v.p. airscrews as Drover 1; with fixed pitch airscrews as Drover 1F; or double-

Aircraft Designed by de Havilland Aircraft of Canada Ltd.

slotted flaps as Drover 2. Prototype *VH-DHA* first flown by Brian Walker on January 23, 1948 was used by the Dept. of Civil Aviation until it crashed in the Coral Sea on April 16, 1952. The second Drover, *VH-BMU*, was sold to the Air Navigation and Trading Co. Ltd. in 1959 for joyriding over Blackpool but was never delivered in England. The third, *VH-EBQ*, built for the parent company, Hatfield, as *G-ALLK* in 1949 and which had earlier failed to arrive, served with QANTAS on local services in New Guinea until ditched in the Huon Gulf on July 16, 1951.

Initial deliveries were *VH-DRA* to 'RE, used by Trans Australia Airlines from 1951–52 until taken over by Australian National Airways in 1956; *VH-FDA* and 'DC to the Royal Flying Doctor Service, Sydney 1951–56; *VH-AZM*, 'ZN and 'ZS to the Dept. of Health, Canberra; and the last production aircraft, *VH-AHZ*, to A. T. Reid, Carlingford, N.S.W. Four used by QANTAS from 1951 included *VH-EAZ*, later re-lettered *VH-EAS*, which was shipped to Liverpool Docks for the Air Navigation and Trading Co. Ltd. in September 1961 to become *G-APPP*, never flew in England and was given to the Southend Historic Aircraft Museum in May 1967. The others, *VH-EBR*, 'BS and 'BT, sold to Fiji Airways Ltd. as *VQ-FAO*, 'AQ and 'AP respectively in 1954, were joined two years later by *VQ-FAR* and 'AS straight from the factory.



VH-FDC, second Lycoming engined Drover 3 for the Royal Flying Doctor Service.
(J. H. Blake Photo.)

Royal Flying Doctor Service Drover *VH-FDA* was the first of several re-engined with three 180 h.p. Lycoming O-360-A1As with Hartzell constant speed airscrews as Drover 3s. Re-delivered on June 4, 1960, it carried pilot, two medical staff and two stretcher cases.

Drover 3 data in parentheses: Span 57 ft. 0 in. Length 37 ft. 0 in. (36 ft. 6 in.) Wing area 325 sq. ft. Tare wt. 4,100 lb. (4,600 lb.) A.U.W. 6,500 lb. Cruise 140 m.p.h. Initial climb 800 ft./min. (1,040 ft./min.) Range 500 miles (900 miles).

Production: Twenty aircraft only, c/n 5001 to 5020.

As detailed in the main text, de Havilland Aircraft of Canada Ltd. erected some 40 D.H.60M Moths, one D.H.61 Giant Moth and at least 25 D.H.80A Puss Moths from small components made at Stag Lane. Immediately prior to and during the Second World War, large scale production of wholly Canadian-built Hatfield designs took place in the Downsview, Toronto, works as under—

D.H.82A Tiger Moth	25	D.H.83C Fox Moth	54
D.H.82C Tiger Moth	1,528*	D.H.98 Mosquito	1,134

* Plus 200 fuselages shipped to Britain.

Commencing with the D.H.C.1 Chipmunk basic trainer designed in 1946 under the direction of W. J. Jakimiuk, and continuing through the remarkable Beaver–Otter–Caribou–Buffalo–Twin Otter–Dash 7–Dash 8 STOL family, there are now eight aircraft types in world-wide use which have been wholly designed and built by de Havilland Aircraft of Canada Ltd. Additionally, Chipmunks have been built by OGMA in Portugal and by the parent company at Hatfield and at Hawarden Aerodrome, Chester, where Beavers were erected for the British Army. Total production to

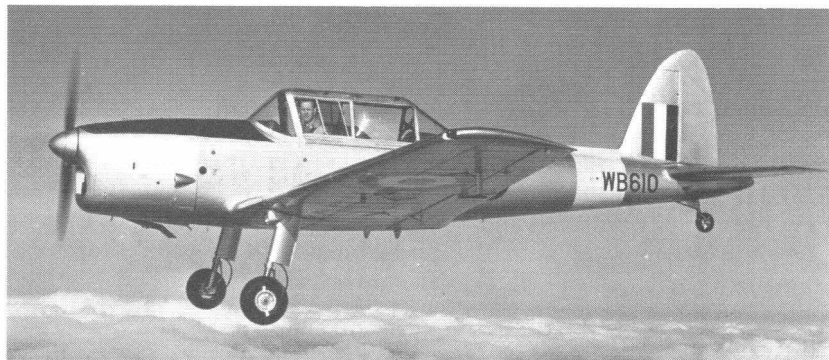


The original D.H. Canada 'works'—a shed on a railway siding at Mount Dennis, Ontario in 1928.

October 1970 amounted to—

D.H.C.1 Chipmunk	D.H.C.2 Beaver	D.H.C.3 Otter	D.H.C.4 Caribou
Downsview . . . 218	Beaver 1 . . . 1,631	Total . . . 466	Total . . . 295
Hatfield . . . 111	Beaver 2 . . . 1		
Chester . . . 889	Beaver 3 . . . 60		
OGMA . . . 60	Total . . . 1,692		
Total . . . 1,278			

Details of the company's subsequent aeroplanes, the D.H.C.5 Buffalo, D.H.C.6 Twin Otter, the quiet STOL Dash 7 and 8 are outside the scope of this book since all went into production after the Hatfield company had become part of Hawker Siddeley Aviation Ltd. The Canadian company is now owned by Boeing.



W. P. I. Fillingham flying Chipmunk T. Mk. 10 *WB610* on test for the Royal Air Force in 1960.

D.H.C.1 CHIPMUNK

Metal tandem two seater; prototype *CF-DIO-X* first flown May 22, 1946 by W. P. I. Fillingham; 158 DHC-1B-1 (145 h.p. Gipsy Major 1C) and 60 DHC-1B-2 (R.C.A.F. Mk. 30) with 145 h.p. Gipsy Major 10-3 and one-piece canopy built in Canada; 111 built at Hatfield and 889 at Chester. British-built aircraft were mainly T. Mk. 10s for the R.A.F. (145 h.p. Gipsy Major 8) to Specification 8/48 commencing *WB549*, and export T. Mk. 20s for the air forces of the Arab Legion, Burma, Ceylon, Colombia, Denmark, Egypt, Iraq, Ireland, Lebanon, Portugal, Saudi Arabia, Syria, Thailand and Uruguay. Also a small number of civil Mk. 21s for Air Service Training Ltd., Hamble; the Ministry of Civil Aviation, Stansted; and for Australia, Indonesia, Japan and Tanganyika. Sixty others built under licence by OGMA, Portugal.

When declared surplus, large numbers of Service aircraft were civilianised in Canada, Britain and Australia as Mk. 22 or Mk. 22A (increased fuel) for world sale. Five single seat Mk. 23 agricultural conversions were made in Britain 1958–66, and another, *G-ATTS*, was



The prototype Chipmunk 23 single-seat crop sprayer, *G-APMN*, devised by de Havillands in 1958 with built-in slots and raised pilot position.

modified by Hants. and Sussex Aviation Ltd., Portsmouth in 1966 as test bed for the 118 s.h.p. Rover TP-90 gas turbine. Australian conversions included the Sasin SA-29 Spraymaster and the Aerostructures Sundowner sport single seater.

Chipmunk *G-AOSU*, re-engined with a 180 h.p. Lycoming O-360-A1A flat four air-cooled engine and first flown at St. Just, Cornwall, went into service at Bicester as a glider tug for the R.A.F. Gliding and Soaring Association in September 1975. *G-ARWB* was exhibited at the 1976 Farnborough S.B.A.C. Show as test bed for the 200 h.p. Bonner engine.

One Canadian-built Chipmunk, *CF-CYT-X*, was powered by a 210 h.p. Continental IO-260-C for aerobatic purposes and first flew with this engine piloted by J. P. Huneault at Quebec on July 16, 1969. Others, known as Super Chipmunks, were reworked in the U.S.A. by Art Scholl and others for international competition aerobatics with 260 h.p. Continental GO-435s.

Data for T. Mk. 10: Span 34 ft. 4 in. Length 25 ft. 5 in. Wing area 172½ sq. ft. Tare wt. 1,425 lb. A.U.W. 2,100 lb. Max. speed 138 m.p.h. Cruise 119 m.p.h. Initial climb 840 ft./min. Range 280 miles.



Five of a batch of export Chipmunks for the Portuguese Air Force at Hatfield in Class B markings in 1951.



D.H.C.2 Beaver Mk. 1 floatplane *CF-OMI*.

D.H.C.2 BEAVER

Metal STOL bush transport for six passengers or $\frac{1}{2}$ ton freight, powered by one 450 h.p. Pratt and Whitney R-985 Wasp Junior. Available on wheels, skis, floats or as amphibian. Prototype *CF-FHB-X* first flown by Russell Bannock on August 16, 1947. A total of 1,692 sold before production ceased, more than 50% to U.S. Army and U.S.A.F. as L-20A/U-6A and the remainder exported to more than 60 countries.

Forty to British Army Air Corps as Beaver A.L. Mk. 1 and one, *G-ANAR*, to the de Havilland Aircraft Co. Ltd., Hatfield 1953 as Beaver 2 with 550 h.p. Alvis Leonides 502/4, increased span and fin area.

The 1,535th airframe was converted on the production line with lengthened fuselage, larger vertical tail surfaces and 578 e.s.h.p. Pratt and Whitney PT6A-6 propeller turbine as the Turbo Beaver, or Beaver 3, *CF-PSM-X*, first flown December 30, 1963. Although the Beaver 2 was not proceeded with, a total of 60 Beaver 3s was built.

(Beaver 1) Span 48 ft. 0 in. Length 30 ft. 3 in. Tare wt. 2,810 lb. A.U.W. 4,820 lb. Cruise 137 m.p.h.

(Beaver 2) Span 48 ft. 8 in. Length 31 ft. 9 in. Tare wt. 3,255 lb. A.U.W. 5,100 lb. Cruise 156 m.p.h.

(Beaver 3) Span 48 ft. 0 in. Length 35 ft. 2 in. Tare wt. 2,590 lb. A.U.W. 5,100 lb. Cruise 140 m.p.h.



Production D.H.C.3 Otter for Philippine Air Lines.

D.H.C.3 OTTER

Metal STOL utility transport for 14 passengers or one ton freight powered by one 600 h.p. Pratt and Whitney R-1340 Twin Wasp and available on wheels, skis, floats or as amphibian. Originally known as the King Beaver, prototype *CF-DYK-X* was first flown by George Neal on December 12, 1951. A total of 466 was built before the type went out of production. Served with the U.S. Army as the U-1A and U.S. Navy as the U-1B; also with the R.A.A.F., R.C.A.F. and the air forces of Burma, Chile, Colombia, Ghana, India, Indonesia and Norway. About 100 were used by the world's civil airlines, bringing the number of countries which bought the Otter to 36.

Sixty-six Otters supplied to the R.C.A.F. were used from 1953 onwards for aerial photography and arctic search and rescue. One, serial 3667-X, flew with an enormous steel force-measuring rig on its back supporting a large aerodynamic model of de Havilland Canada's first twin engined aircraft, the D.H.C.4 Caribou.

G-ANCM and *G-AOYX*, two civil demonstrators delivered to the de Havilland Aircraft Co. Ltd., Hatfield 1953/1957, were eventually disposed of in India and Portugal respectively 1957/1961.

Span 58 ft. 0 in. Length 41 ft. 10 in. Tare wt. 4,165 lb. A.U.W. 7,600 lb. Max. speed 160 m.p.h. Cruise 139 m.p.h. Initial climb 850 ft./min. Range 960 miles.



de Havilland Canada's original D.H.C.4 Caribou demonstrator *CF-LVA*.

D.H.C.4 CARIBOU

Conceived as a twin Otter with two 1,450 h.p. Pratt and Whitney R-2000-7M2 radials, the Caribou STOL military support aircraft had a rear facing hatch and ramp for vehicles and artillery and could carry three tons of freight or up to 32 troops. Prototype *CF-KTK-X* first flown by test pilots George Neal and David Fairbanks at Downsview on July 30, 1958. Served with the R.C.A.F. as the CC-108 but the principal user was the U.S. Army which evaluated five pre-production aircraft in 1957 under the designation YAC-1 and placed an order for 164, known initially as AC-1s and after 1962 as CV-2As. They were redesignated C-7A when transferred to the U.S.A.F. in 1968. Later deliveries were CV-2B/C-7Bs.

On October 22, 1959 the company's civil demonstrator, *CF-LAN*, made a globe-circling four month tour of 47 countries. It crossed the South Atlantic to the Azores, visited Britain and continued through four continents to Australia. Sales were made to the R.A.A.F. and to the air forces of Ghana, Kuwait, India and Kenya.

In 1960 the prototype Caribou was flown with two 2,600 s.h.p. General Electric YT-64-GE4 gas turbines during the design stage of the similarly powered D.H.C.5 Buffalo and in the 1970s surplus R.C.A.F. Caribous (which had seen considerable United Nations service) were sold in Colombia, Oman, Tanzania and elsewhere.

Span 95 ft. 7½ in. Length 72 ft. 7 in. Height 31 ft. 9 in. Wing area 912 sq. ft. Tare wt. 16,920 lb. A.U.W. 28,500 lb. Economical cruise 181 m.p.h. at 7,500 ft. Initial climb 1,575 ft./min. Maximum range 1,280 miles.

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